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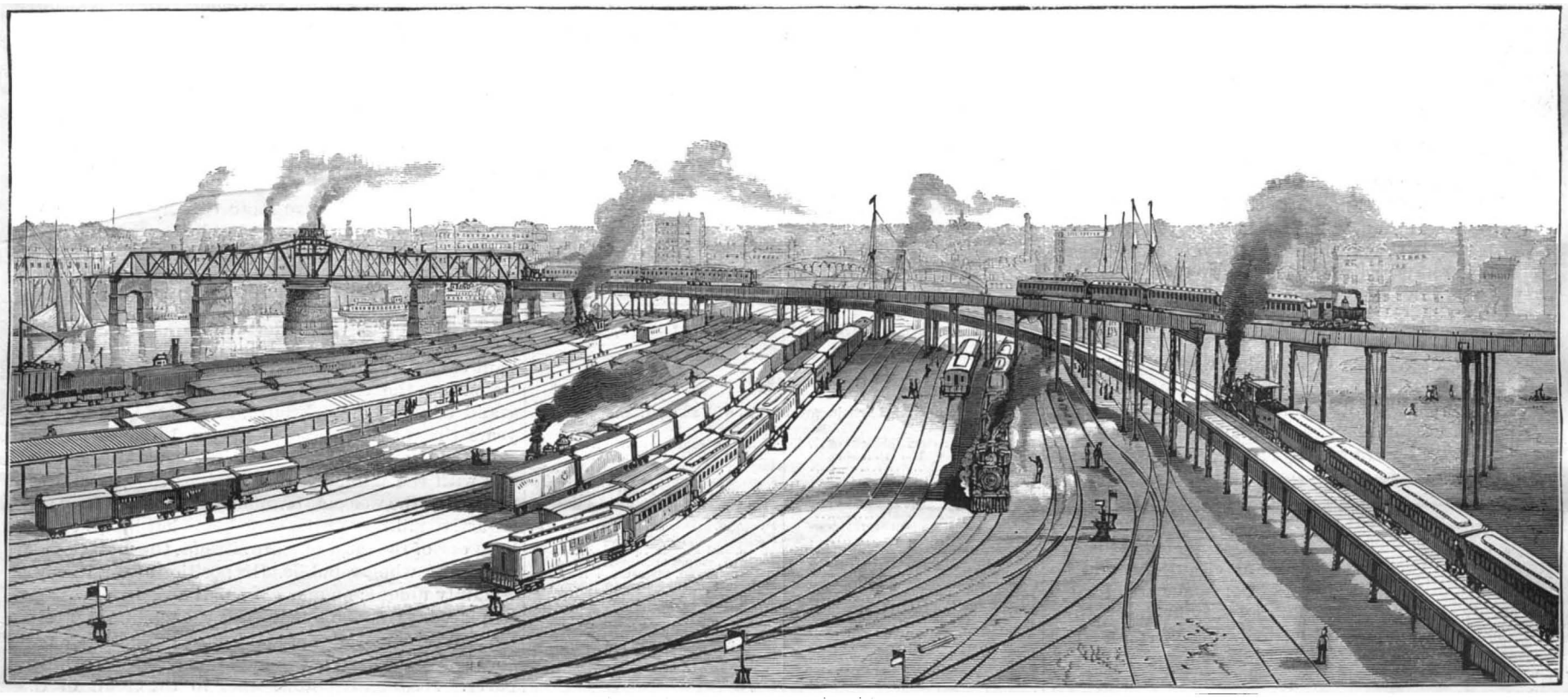
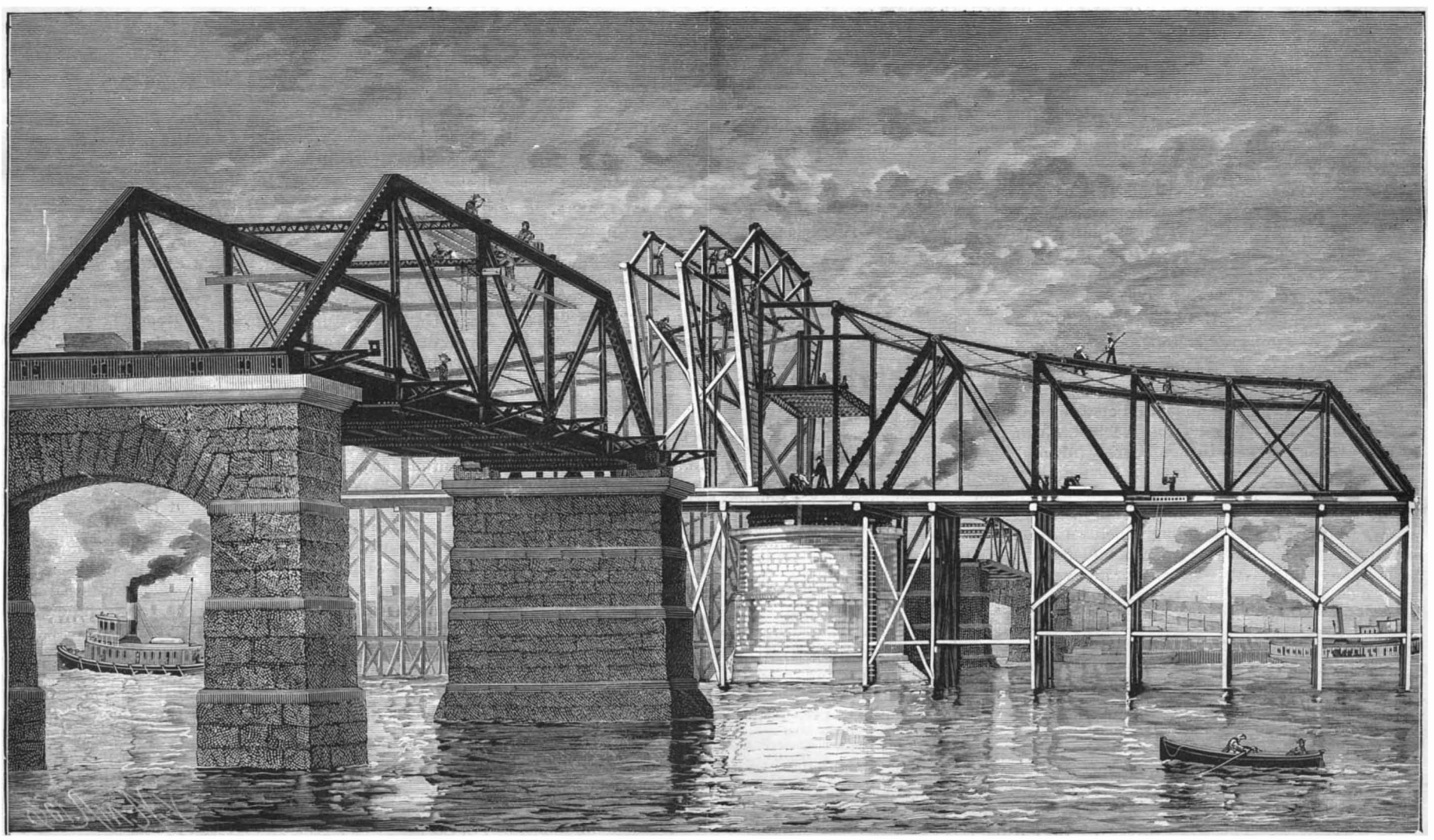
PLANS OF THE SUBURBAN RAPID TRANSIT CO.

The accompanying engravings accurately represent the work now being done by the Suburban Rapid Transit Company, of this city, across and on the northeastern side of the Harlem River at the head of Second Avenue. The views, being confined solely to the immediate neighborhood of the bridge, convey no idea of the real magnitude of the work to be done by the company and the influence it will exert in aiding the development of the annexed district north of the Harlem, or of the increased facilities it will afford the railroads entering from the north for reaching the lower part of the city. The Harlem will be crossed by a drawbridge on a level with the Second Avenue elevated railroad. On the north shore there will be four elevated tracks leading from the bridge; the two center ones will run down and terminate in the yard of the New York, New Haven and Hartford railroad, and the two side ones will be continued in a northerly direction as elevated roads. (This is the portion of the work embraced by the engravings.) The plan contemplates the construction of three parallel lines through the Twenty-third and Twenty-fourth wards, uniting, of course, at the bridge. This will not only accommodate all local travel, but will also provide a downtown outlet for all the steam railroads crossed by it.

The bridge is a pin connected through structure 245 feet in length from end to end, 26 feet in width from center to center of trusses, 20 feet deep in clear at the ends, and has a foot walk 6 feet wide at each side and a double track railroad in center; the clear opening each side is 103 feet 9 inches. The piers are masonry, supported in some cases upon piles and concrete, and in others extended to a good natural foundation. The center pier is 32 feet 9 inches in diame-



GENERAL VIEW OF SUBURBAN RAPID TRANSIT CROSSING OF THE HARLEM RIVER AND YARDS OF THE N. Y., N. H, & H. R. R.



VIEW OF THE HARLEM RIVER BRIDGE OF THE SUBURBAN RAPID TRANSIT COMPANY, NEAR SECOND AVENUE.

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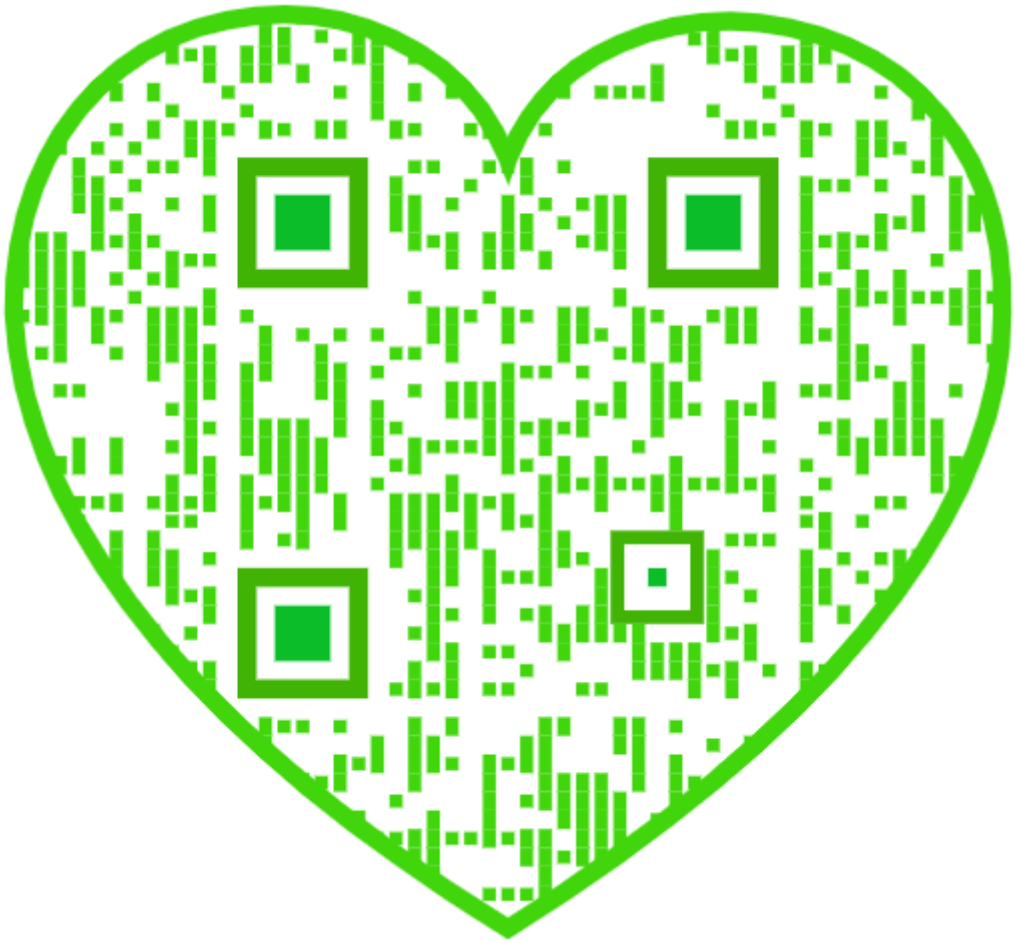

ter; all the piers are of such height as to raise the structure 28 feet 8 inches in the clear above water level. The bottom chords consist of latticed channels —12 inches—varying in section according to the strains coming upon them. The upper chords extend upward in a parabolic curve toward the center. All the posts are latticed channel columns, and the diagonals are forged links. The floor beams are plate girders, and are suspended from the lower chord pins by plate hangers, and the foot walk brackets are riveted to the hangers by the same rivets that secure the floor beams.

The drum of the draw, which is entirely rim bearing, is 26 feet in diameter, and is formed of two channels 12 inches deep. The weight of the span is transferred to and distributed over the drum by two longitudinal girders in line with the trusses, two cross girders under the central posts, and short inclined connecting girders. All the hydraulic machinery for operating the wedges and turning the bridge is in a room, the floor of which is carried on girders riveted to the central parts of the trusses at an elevation equal to that of the portals. The bridge rests and turns upon a ring composed of 54 cast iron coned wheels, 16 inches in diameter at the base, which are spaced and held truly radial by two guide rings, one inside and one outside of the wheels. The axle of each wheel is connected by a tension rod to a movable center, to which the guide rings are also braced by struts of angle iron. This resembles a large horizontally placed wheel, the hub being formed by the movable center, the spokes by the tension rods and axles, and the face by the cones. The axes of the wheels are inclined upward, toward the center, at such an angle as to bring the upper bearing lines of the wheels in a horizontal plane. The upper bearing plates are of wrought iron planed flat, and the lower track circle is of cast iron segments bolted together by lugs and firmly anchored to the masonry; its bearing surface is planed to conform to the inclined position of the wheels. The outer guide ring for receiving the operating ropes that turn the draw is supported by cast iron winged nuts projecting from the outer ends of the axles. The movable center turns upon a steel shaft 6 inches in diameter. At each side of the draw is a fixed span, supported upon masonry piers of 95 feet from center to center. The drawbridge was erected upon false work resting upon piles and placed parallel with the river, as shown in the lower engraving.

To properly shift the twenty-nine tracks in the yard so as not to interfere with their use, and at the same time obtain the requisite space in which to place the posts supporting the elevated roads, was a task requiring care and judgment. The difficulty may be understood from the fact that in the completed structure there are no two girders, no two elevations, and no two skews alike. The plate girder spans are of varying lengths to suit the tracks, and vary in depth from 42 to 72 inches, in proportion to length of span. The cross girders are from 30 to 60 inches deep. The columns are 12-inch latticed channels, and vary in section, according to the load brought upon them by the spans. No longitudinal bracing could be put in on account of the lower tracks, the minimum head room being 15 feet. All the work is proportioned to carry heavy Mogul freight loads.

The outgoing suburban track crosses the center ones, which run to the yard, and after leaving the bridge turns to the right and extends parallel with the yard tracks to a point where the descending center tracks permit its crossing. The maximum grade is 65 feet per mile. The incoming track is independent of the others. The center tracks approach the ground by an easy grade.

Mr. S. R. Filley is the president, and Mr. J. J. R. Croes is the chief engineer of the company. All the iron work was designed by Mr. Theodore Cooper, consulting engineer for the company.

Two Thousand Miles on a Bicycle.

The longest bicycle ride ever made has just been completed by Mr. H. R. Goodwin, of the North Manchester Club. Leaving Land's End on June 1, he journeyed to John o' Groat's, having reached which point in 7½ days, he at once turned southward, and again arrived at Land's End on the 16th, the double journey of about 1,750 miles, or from one extremity of England to the other, having occupied less than 16 days. From Land's End he rode to London, which was reached on the 19th, the rider having thus completed a journey of 2,050 miles in exactly 19 days, or an average of 108 miles a day. Mr. Goodwin rode a 40 inch "Facile" safety bicycle, and arrived in London well.

The Deepest Bore Hole in the World.

The deepest boring yet made is at the village of Schladebach, near the line between Leipzig and Corbetha. It has been made by the Prussian government to test for the presence of coal, and was bored with diamond drills. Its depth is 1,390 meters (4,560 feet, its breadth at the bottom 2 inches, and at the top 11 inches. It has occupied 3½ years to bore, and cost a little over £5,000. The temperature at the bottom is 118° Fah.

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NEW YORK, SATURDAY, AUGUST 1, 1885.

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GENERAL GRANT.

At eight minutes after eight on Thursday morning, the 23d of July, 1885, the lingering illness of America's greatest citizen terminated in death. General Grant was no more. Nine months of weary fighting against an incurable disease had brought so much pain and suffering that even those to whom he was most dear could not but feel a sad pleasure that the conflict was finally over and the great hero at rest. With his sickness we are all familiar, and from North to South the whole country has felt but one sentiment, that of profound sympathy for an illustrious sufferer, whose terrible illness experienced but little alleviation and could know no cure. And now that it is all ended, and the sad message has been flashed around the globe that the peace of death has fallen, that the world has lost a hero, the nation which claimed him as her own, and the people who delighted to do him honor, remember their loss and mourn for their illustrious dead. Though the remarkable career of General Grant is known in its outlines to all of us, and though many of us have followed the brilliant life from the time when his name was first heard over the land to the time when death came, yet it is, nevertheless, a pleasure to recall again the history of a man whose destiny was so closely linked with that of the nation, and whose achievements have added so much to her glory.

It seldom occurs that a man who at sixty-three occupied the position accorded to General Grant, is at forty almost totally unknown, yet at the beginning of the Civil War such was the case, and few things seemed then so improbable as that this quiet, self-contained man should ever reach a cosmopolitan fame. It is true that he had distinguished himself in the Mexican War, that at Monterey, Vera Cruz, and before the city of Mexico he had shown those splendid soldier-like qualities which were afterward to be tested in a conflict where the opposing forces were more equally matched; but his services seemed to attract but little attention at the time, and we find him shortly afterward settled quietly on a small farm, bearing the bitter burden of poverty and failure. But with the fall of Fort Sumter his career began anew, and from his obscurity at Galena he passed with wonderful rapidity through those brilliant campaigns which resulted in the capture of Fort Donelson, the carnage of Shilo, and, finally, in the grand triumph at Vicksburg, and placed him in three years' time at the head of the Federal armies.

At that time events closely followed upon each other, and with the Wilderness Campaign, the fall of Richmond, and the welcome termination of an unhappy war, his active military duties ended, and left him, who had been one of the most obscure citizens, the most popular man in the whole republic. His position at this time was certainly unique; no one else, perhaps, has ever been so placed. He was by all odds the man most available as a presidential candidate, and, curiously enough, could have received the nomination of either political party. Nothing redounds more to the credit of this great general, to whom so much honor has been given, than the deep sentiment of respect which has always been felt towards him by those people whom he was forced by circumstances to subdue, and to-day many of the most touching tributes to the memory of the dead hero have come from the South, from the very men who were conquered by his genius. It is indeed a great thing that the central figure of a civil conflict should hold the affection of an entire people, that he is regarded without bitterness, and mourned as the nation's loss.

PETER H. WATSON.

Among the strong, brave men who bore conspicuous parts in the late rebellion, though little known to the general public, was the late Peter H. Watson, who died at his apartments in the Albert, Eleventh street and University Place, this city, July 23, in the 68th year of his age. Mr. Watson was assistant to the late "Iron Secretary of War," Mr. Edwin M. Stanton.

Mr. Watson was literally a self-made man. Commencing his career at Washington City as a solicitor of patents, by indefatigable perseverance and industry rose in his profession to the highest point. When Mr. Stanton was called to the Cabinet of Mr. Lincoln, Mr. Watson abandoned his lucrative profession at the urgent request of Mr. Stanton, and entered the war office as assistant, and during those stirring times rendered important and valuable services in his department, and when the war closed, like the other members of that remarkable administration, returned to private life and the pursuit of science, to which he was inseparably wedded. Notwithstanding Mr. Watson was not prominently before the public, he was nevertheless personally known and highly esteemed by the great men of his time, and not a little singular is the coincidence that he should die on the same day with General Grant, for whom he held the highest admiration, having known the great commander intimately, at the time when truly "men's souls were tried."

In speaking of Mr. Watson, we join all who knew him in expressing our sorrow at his loss personally, and to the scientific world, and accord to him every praise for his faithful and indefatigable services throughout

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the rebellion, and point to him with admiration as one of our self-made men.

Among the remarkable things that occurred in cabinet councils during the war is that related by Mr. Watson, illustrating the peculiarly modest character of Mr. Lincoln in important measures of which he was the author.

At a special meeting called by President Lincoln, he found himself alone in the chamber while waiting for his cabinet, and commenced to read "*Artemus Ward His Book*," left there by some early visitor. One after another the members came in until all were present, and still Mr. Lincoln read on, and finally began reading aloud some part that seemed to amuse him, upon which Mr. Stanton remonstrated in his peculiarly strong manner, remarking that if he (Mr. Lincoln) had nothing of more importance to communicate, he could continue to read, but that he (Stanton) had something else to do, and was about to withdraw when Mr. Lincoln requested him to remain. Laying down "His Book," and the warm genial face of the President changing from mirth to earnestness and troubled anxiety, he remarked that he had a paper to read to them, and, drawing from his pocket a much crumpled manuscript, slowly smoothed the wrinkled pages, and read to his companions the perhaps most remarkable state document of the nineteenth century, a paper that freed four million human beings from bondage, and startled the remotest corners of the world.

And now, after the lapse of nearly a quarter of a century, the effect of this paper is still felt, and gradually but surely the bonds of the slave are passing away. At that time the members of the cabinet were divided as to the expediency of such an important step; some thought it premature and would incite anarchy, others commended his judgment and deemed the time most fitting and proper.

After patiently listening to the various opinions, and thrumming on the window to which he had withdrawn, as if to permit his pent up soul to find relief in the far off valley of Virginia, quietly turned to his friends, and remarked: "Well, gentlemen, I am going to have this paper published in all the newspapers, and then you can each get a copy." Characteristic of that great man, he little thought of the joy and sorrow that his single signature to this paper would cause, and the ultimate revolution in the social world of a class of humanity toiling in bondage with no hope of release. And now that most of that illustrious band have passed away, we feel that history should record the deeds of all engaged in that memorable struggle, and that none who bore a part should be forgotten.

PANAMA VS. TEHUANTEPEC.

The congress which met in Paris in 1879 to decide on the Panama route and a tide-level canal, under which conditions M. De Lesseps gave his name to the enterprise, put the estimated cost at somewhat more than $200,000,000. Subsequently M. De Lesseps visited the Isthmus with an "international technical commission," and, after eight weeks' surveying—although the work to be done was reported greater than at the commencement—the original estimated cost was actually cut down to about $125,000,000, and on this statement from him the money of French investors began to pour in for the building of the canal. Up to the beginning of this year there had been thus raised $150,000,000, counting also the expense of raising the money, and this had been so far spent in September last as to leave a balance of less than $10,000,000. Later and exact figures are not to be had, but it is continually becoming apparent that the quantity of excavation to be done has enormously increased, the estimates now placing it at least three times as much as was calculated upon at the original congress in Paris. It is to be remembered, also, that the whole work is not yet surveyed, and the problem of disposing of the waters of the Chagres River is yet to be met.

Taking all these items into consideration, and putting off the time of completion at least as far as 1892, the London *Financial News* puts the probable cost of the canal, including discounts, at $530,000,000. Whether M. De Lesseps has any charm by which he can manage to raise all this money among French investors, or whether any one thinks the French Government might eventually seek a controlling interest and complete the work, because the money now represents so many small subscriptions of Frenchmen, are questions we do not seek to pursue.

Any statement as to the Panama Canal, however, necessarily calls up the Tehuantepec project, the Nicaragua scheme seeming for the present out of the question, as one which would possibly cost nearly as much as the Panama, and be quite as long before completion. About $300,000 has so far been spent for an inception of the Tehuantepec scheme, careful instrumental surveys having been made from ocean to ocean, and hydrographic surveys of the harbors and water connections at each end of the line. The length of the route proposed is 134 miles, there will be nowhere any heavy grades, and it is actually demonstrated by the surveys that there can be no exceptionally difficult work in making a railway and suitable harbors. The estimates for cost, therefore, may be made with far more confidence than was the case with the Panama Canal, and Captain Eads places the figures for the whole work at $75,000,000, for a road that will give a tonnage capacity equal to that of the Suez Canal.

While, therefore, the proposed ship railway of Captain Eads has been before the public for many months, the capital has not yet been obtained to build it, although more than is necessary for its completion has been invested in small sums in France for a canal at Panama. The advantages of the more northern route for interoceanic communication, and the exceedingly liberal concessions offered by the Mexican Government in support of the enterprise, have not been sufficient to induce capitalists to make the investment, as yet, in the absence of some positive support by the United States Government, which would certainly have a large interest in any such channel of communication between the Atlantic and Pacific from the moment of its completion. Perhaps a large portion of this apparent want of confidence among investors proceeds from the fact that no such ship railway as this was ever before built. Its practicability and economy have, however, been testified to by the most eminent shipbuilders and engineers in this country and Europe, among whom are included three of the chief constructors of the United States Navy; the present constructor of the British Navy, and his predecessor in office; the Chief Engineer of the Liverpool docks; the present scientific advisor of Lloyd's Register of British Shipping, and his predecessor, now the chief superintendent of the Barrow Ship Building Works; the builder of the Oregon, Alaska, and other famous steamships, and numberless other naval architects and engineers of the very highest standing in their professions.

Mr. Eads, therefore, in the absence of the necessary popular support, asks the government to guarantee that the road shall pay a net revenue of $2,500,000 per year, the Mexican Government having already agreed, with this provision, to guarantee $1,250,000 per year, such guaranty to attach only after the completion of the road. The promoters of the enterprise do not believe the government will be called upon to pay any portion of this guaranteed sum, but Captain Eads, in a letter to Secretary Bayard, expresses the opinion that with such guaranty the necessary capital can be raised, and the road completed in four years.

PRESSURE AT GREAT SEA DEPTHS.

In *Science* for July 17, p. 54, the deep sea fishes secured by the "Challenger" are mentioned as coming from "regions where the water permeating all their bodies is under immense pressure; but the tissues must be loose to admit of such permeation, or they would be crushed and ruined under a weight which shivers solid glass to powder." The statement needs revision, as to both fact and theory. We will see the theory first; the facts may come later.

Obviously the same rules of pressure apply in every instance, be the amount of pressure greater or less, on the surface of the sea (our ordinary status), or at 10,000 fathoms. Action and reaction are equal, and where pressure is fully counterbalanced it becomes actually no pressure. We say that ordinary pressure of the atmosphere is, in round numbers, fifteen pounds to the square inch, and the common air-pump experiment proves it. When we open the stop-cock, the receiver, which had been firmly fixed to the plate, at once becomes loose and free. Why? There is precisely the same amount of pressure on its external surface that existed a moment before, and yet we lift it now easily, and we say truly that it is because the pressure within and without is the same, and that the result is *no pressure*.

In our own personal condition, we move without consciousness of any difficulty whatever, notwithstanding that mythical number of tons that the school books figure out for us as our normal load, by applying the regular fifteen pounds to our superficial inches, and we are every one of us conscious that no such burden has any existence. It is truly a myth and a most absurd one. The simple truth is that each individual microscopic cell of our entire structure, though not in sensible manifestation filled with air, is in direct correlation and connection with the surrounding atmosphere, as completely as though we could show it by microscope and test-tube. The air cells of our lungs are no more truly balanced in air pressure than are the microscopic cells constituting the membranes which form each air cell, and, being thus balanced in all parts, the superincumbent atmosphere is to us no "Old Man of the Sea," and we are as free to move as though it had no weight whatever. This our continued experience shows us, and we feel no wonder at it. But the same thing must necessarily be true under other degrees of pressure, and a fish at 5,000 or 10,000 fathoms doubtless experiences no sense of burden, nor does he find any more difficulty in moving than a trout in his native brook or a gold fish in one of our glass globes. Every cell of his tissues is perfectly balanced in its relations to the surrounding water, and his organs of motion show us beyond question that his movements are as free as ours in the air.

The proposition as given above, that "the tissues must be loose to admit of such permeation," etc., can scarcely be maintained by good argument. No reason is apparent why water at any depth should not balance itself as readily in firm tissues as in those that are loose, and we know, in fact, that it does so. Every one of the deep sea fishes has more or less of parts that are relatively solid, although the muscular fibers may be loosely aggregated. Bones are manifest, and it is plain that every one of these must be subject only to balanced pressure, that is, no pressure. If we suppose even a single fiber to be subjected to "a weight which shivers solid glass to powder" (provided there is an air space in the glass), it is not difficult to see what result must take place. The jaws of a vise or the end of a set screw could not jam it tighter, and every semblance of organization would be obliterated. Such pressure never occurs to any living creatures, or to any of their parts, without their instantaneous destruction.

But having looked now at the theory, a word is due, also, as to the facts cencerning ths residents of the deep sea. The looseness of tissue among the fishes generally is not disputed, but the same thing is not true concerning the animals of lower grade. Crustaceans, mollusks, etc., are found in large numbers, and their construction is in wide contrast with that of the fishes; they are reasonably firm and solid, which necessarily could not be were looseness and great depth correlative conditions.

We can now readily understand how incorrect and inconclusive were the experiments of M. Regnard last year on this point. He used a special apparatus by means of which he could bring to bear a pressure of 1,000 atmospheres. He tried it on a "golden cyprin" in water, and at 400 atmospheres the fish was "dead and absolutely rigid;" nor can we wonder, although the curious and inexplicable attempt had been made to save him by exhausting his air-bladder in advance. His tissues were of course adjusted in balance to only our surface pressure, and the artificial and rapid addition first paralyzed him, and then literally squeezed him to death. Solid iron could not have crushed him tighter. Theoretically it would be possible for a fish of the deep sea to change his habitat to the upper waters by making the transit through slow gradations, but that this is ever done practically we have no means of knowing. The specimen of *malacosteus*, the earliest known of these deep sea fishes, was found floating at the surface, but he was nearly dead, and had doubtless come up from some abnormal cause.

W. O. AYRES.

The Jablochkoff Auto-Accumulator.

The battery is composed of a number of cells or shallow trays, 4 inches square and ½ inch deep, of impermeable carbon, in each of which is placed a small quantity of iron turnings or zinc clippings. Over these is placed a covering of thick coarse canvas, saturated with a solution of chloride of calcium, upon which is laid a row of very porous carbon tubes, about 3 inches long and ⅜ inch diameter outside, which are similarly saturated. In this way a cell is formed with three electrodes, one of which oxidizes, a second becomes polarized, and the third forms a positive pole with the second, the first two forming a couple with a constantly closed circuit. For service a number of these cells—nine or ten—are placed within a metallic framing, after the fashion of a voltaic pile, the bottom cell resting on a metal plate forming one of the poles. The top cell is covered with a plate of carbon, to which a terminal is fixed, and this forms the other pole. The auto-accumulator produces alternately a primary and secondary current, the latter only being employed in the external circuit, while the former serves to produce the hydrogen necessary to polarize the electrodes. This action stops as soon as polarization is complete, and is resumed when depolarization takes place, so that short and frequent intervals of rest are necessary for the battery to reform itself for the production of the useful current. In practice, when this current is employed for continuous work, the batteries are coupled in groups with commutators, so that no interruption in the current takes place.—*London Times.*

IN science nothing can be permanently accepted but that which is true, and whatever is accepted as true is challenged again and again. It is an axiom in science that no truth can be so sacred that it may not be questioned. When that which has been accepted as true has the least doubt thrown upon it, scientific men at once re-examine the subject. No opinion is sacred. "It ought to be" is never heard in scientific circles. "It seems to be," and "we think it is," is the modest language of scientific literature. In science all apparently conflicting facts are marshaled, all doubts are weighed, all sources of error are examined, and the most refined determination is given with the "probable error." A guard is set upon the bias of enthusiasm, the bias of previous statement, and the bias of hoped for discovery, that they may not lead astray. So, while scientific research is a training in observation and reasoning, it is also a training in integrity.—*Pop. Sci. Monthly.*

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THE LEGAL OHM.

On the 3d of May, 1884, the International Conference for the Determination of Electrical Units decided that the legal ohm should be the resistance represented by a column of mercury of one square millimeter section, and 106 centimeters in height at the temperature of melting ice.

In order to carry out the decisions of the Conference and introduce into practice the standards of resistance, it became necessary to construct fundamental, secondary, and practical standards. The fundamental ones, which are four, so far, were constructed by Mr. Benoit. They consist of straight glass tubes, the dimensions of which have been studied, and which, full of mercury, present a resistance that has been accurately determined by calculation.

This work was performed at the International Bureau of Weights and Measures. The experiments, calculations, corrections, etc., are contained in a quarto volume of more than 500 pages. We shall not even try to give an idea of the nature of this work, which does the greatest honor to the skill and patience of Mr. Rene Benoit. Let us say that the difference between the real and theoretical resistances, deduced from the dimensions, are so small, that the greatest between the four standards established does not exceed two one-hundred thousandths, and the mean result can be regarded as exact at close to one one-hundred thousandth.

These fundamental standards, or prototypes, are very fragile, and are inconvenient for practical use, so Mr. Benoit has got up a certain number of secondary ones of mercury. These (one of which is shown to the left of the engraving) consist of glass tubes bent upon themselves six or eight times, and ending in two cups filled with mercury. These tubes may have any geometrical dimensions whatever. They are adjusted and measured by comparison with the four prototypes, by progressively cutting and polishing the ends until they have a resistance very nearly the same as that of the prototypes. These standards are easily transported, and are easily brought to the temperature of melting ice, but they are still too fragile. They will serve merely as a substitute for the prototypes in important measurements.

For ordinary measurements the standards are made of metal. These instruments, which are constructed by Mr. Carpentier, consist of a bobbin of very coarse wire suspended freely in a metallic box whose sides are lined with a thick layer of paraffine. A thermometer enters through an aperture, and runs to the center of the doubly wound bobbin, and measures the temperature of the air in the interior, which is the same as that of the wire.

This is an improvement upon the old standards, the wire of which enter a mass of paraffine, and is then so fully protected against the variations of the surrounding atmosphere that its own temperature is not known to within several degrees.

These practical standards, as they are called, are made of coarse German silver wire—this metal being selected because it is one of the alloys whose resistance varies the least with the temperature, and *coarse* wire being chosen because slight variations of temperature are less sensible and an exact regulation is more easily obtained.

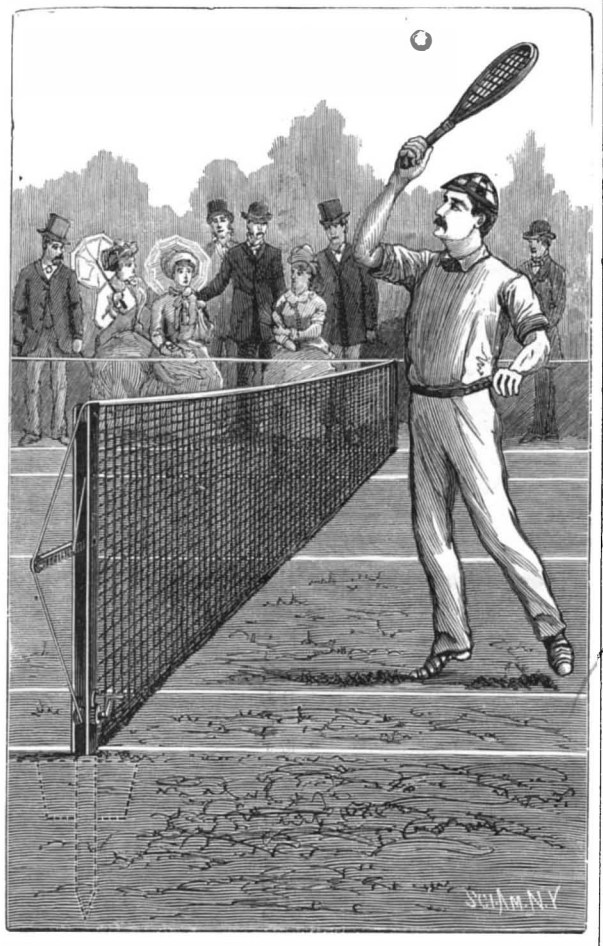
These secondary and practical types are at the disposal of Mr. de Nerville at the Bureau for the measurement of Electrical Resistance established at the Ministry of Port Officers and Telegraphs, and in the care of Mr. Blavier, director of the Upper School of Telegraphy.

The object of this bureau is to place at the disposal of the public practical means of verifying the accuracy of a standard of resistance. The bobbins confided to the Bureau will go out with an official certificate indicating their true value in legal ohms, as well as the degree of precision to which such value has been determined.

The comparisons of resistance are made with a divided wire Wheatstone bridge. The engraving represents the mounting of the apparatus for the comparison of a German silver standard with a secondary mercurial one. The two proportional arms, which are as nearly equal as possible, are formed of two bobbins placed in the same box in order to be always of the same temperature.

The method employed is that of substitution indicated by Fleeming Jenkin, and comparable to the double weighing one employed for comparing weights.

In this style of bridge, which has been studied out and constructed with great care by Mr. Carpentier, all the metallic pieces traversed by the current are of brass. All the contacts are established by means of copper cups screwed on to the bars of the bridge, and filled with mercury. All the metallic pieces are insulated from the base with ebonite. The index moves in front of the scale by sliding; and the equilibrium is perfected by means of a micrometer whose movements are measured by a vernier. The contact of

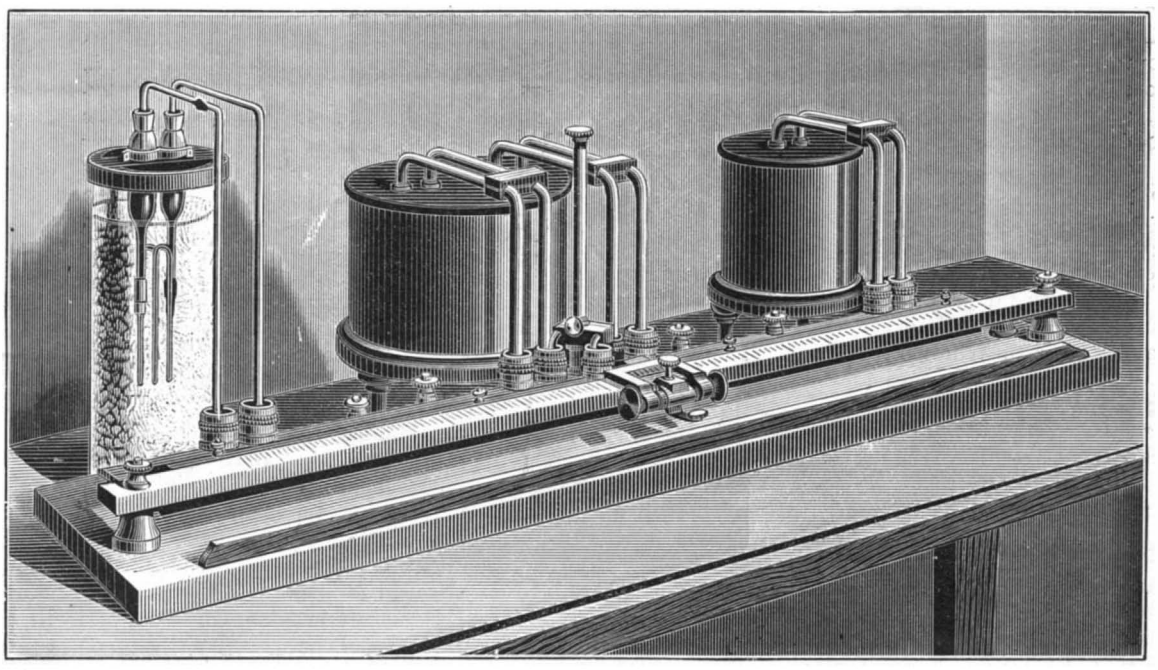


JEFFERSON'S IMPROVED LAWN TENNIS POST.

the metallic knife always occurs at a constant pressure, and is regulated by a screw, thus preventing the wire from getting worn. A mercurial commutator permits of quickly charging the proportional arms. The reversal of the pile is effected by means of an ordinary reversing key.

Without entering into the details of the operations, let us say that a complete comparison comprises five series of four readings each, and the precision in the measurement is such that the figures resulting from the comparison may be guaranteed to one one-hundred thousandth, about.

If it be recalled that the decisions of the International Conference date back scarcely a year, that it has been necessary to establish prototypes, secondary standards, and measuring apparatus, and to organize a service, and that we have already standards, resistance boxes, and *legal ohms* in the market, it will be seen that, in this circumstance at least, France has not been the last to quickly utilize the practical results of a scientific progress in which she took the initiative in 1881 in the convocation of the first International Association of Electricians.—*E. Hospitalier, in La Nature.*



NEW STANDARDS AND MEASURING APPARATUS.

EXPERIMENTS made with gases upon insects proved the Colorado beetle hardest of all. It took prussic acid vapor to kill it, and it was paralyzed in illuminating gas.

IMPROVED LAWN TENNIS POST.

Every lover of lawn tennis appreciates the advantage of having a post that facilitates the ready adjustment of the net to the required height. Mr. Chas. W. Jefferson, of Rugby, Tenn., is the patentee of the post and net tightener which is illustrated in the accompanying cut. This post is quite novel in form, and enables the net to be very quickly raised and lowered, while in construction it is strong and durable.

The post is preferably U shaped, may be made of channel iron, which may be painted or nickel plated as desired. It is secured firmly in an iron socket that is driven permanently into the ground. The rope for raising and lowering the net passes over a roller on the top of the post and thence over a pulley on the end of the horizontal arm, as shown in the engraving. The rope is secured to a reel near the bottom of the post, enabling the net to be raised and secured at the required height. The horizontal arm is pivoted at its inner end, and may be raised and lowered at will. It is held in its horizontal position by the brace rod shown. When the court is not in use it is desirable, as all acquainted with the game are aware, to slacken the net to prevent dampness from tightening it and doing harm to the net and injury to the post. All that is necessary, therefore, is to raise or lower the pivoted arm, and the net will hang loosely in the posts. It is only necessary that one of the posts should be constructed as shown, as the net may be secured permanently in any suitable manner to the other post.

The Great Pyramid.

Mr. J. B. Bailey writes to the *St. James Gazette* as follows, with reference to the desirability of exploring the great pyramid: Now that Great Britain is dominant at Cairo, would it not be a good plan to clear away the sand and rubbish from the base of the great pyramid right down to its rocky foundation, and try to discover those vast corridors, halls, and temples containing priceless curiosities and treasures with which tradition in all ages has credited the great pyramid? The wonderful building, of such exquisite workmanship, was erected many years before any of the other pyramids, which are only humble imitations, built by another nation, and also for other purposes; for neither King Cheops nor anybody else was ever interred beneath this mighty mass of stone. The smaller pyramids also exhibit neither the nicety of proportion nor the exactness of measurement, both of which characterize the first pyramid. From internal evidence it seems to have been built about the year 2170 B. C.; a short time before the birth of Abraham, more than four thousand years ago.

This—one of the seven wonders of the world in the days of ancient Greece—is the only one of them all still in existence. The base of this building covers more than thirteen square acres of ground. Its four sides face exactly north, south, east, and west. It is situated in the geographical center of the land surface of the globe. It was originally 485 feet high, and each of its sides measures 762 feet. It is computed to contain 5,000,000 tons of hewn stone, beautifully fitted together with a mere film of cement. And these immense blocks of stone must have been brought from quarries five hundred miles distant from the site of the building. The present well known king and queen chambers, with the various passages, might also be thoroughly examined by means of the electric or lime lights. The astronomer royal of Scotland some years since closely and laboriously examined all that is at present known of the interior of this enormous building. He states that measurements in the chambers, etc., show the exact length of the cubit of the Bible—namely, 25 inches. This cubit was used in the building of Noah's ark, Solomon's Temple, etc. He also maintains that the pyramid shows the distance of the sun from the earth to be 91,840,000 miles.

A Canadian Ship Railway.

It is said that the construction of a ship railway to connect the Bay of Fundy with the Gulf of St. Lawrence has been finally decided on. Ships of 1,000 tons and under will thus be able to reach St. John from Montreal, Quebec, and other parts of the St. Lawrence, without having to encircle the dangerous Nova Scotian coast, a saving of 600 miles. The ship railway, which is to be seventeen miles long, will, it is expected, be supported by a subsidy of £60,000 per year for twenty years from the Canadian Government.

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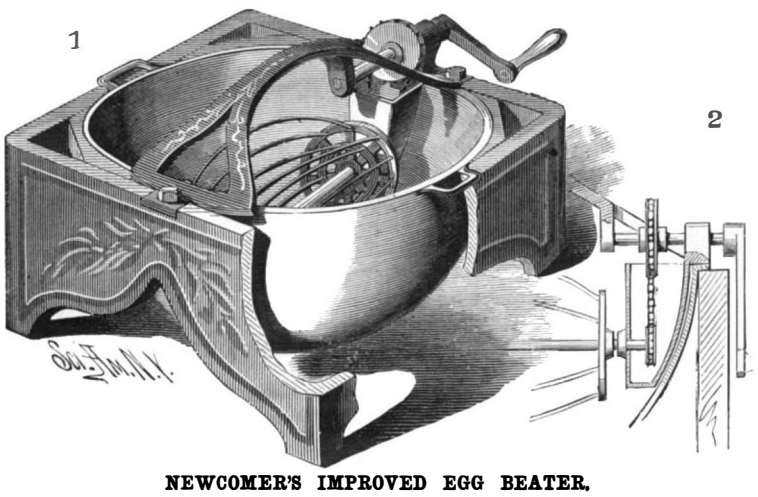
IMPROVED EGG BEATER.

The engraving represents an improved form of egg beater, which may be easily and readily attached to a suitable pan when it is to be used. The rotary egg whip consists of a shaft, having skeleton heads, and wires which are so curved as to make the exterior of the whip conform very nearly in shape with the hemispherical bottom of the pan. By means of this correspondence in shape, the whip may be made to come very near the surface of the pan, thereby permitting small quantities of eggs to be whipped. The frame carrying the whole of the moving mechanism is secured to a wooden stand, in which the pan is placed. The



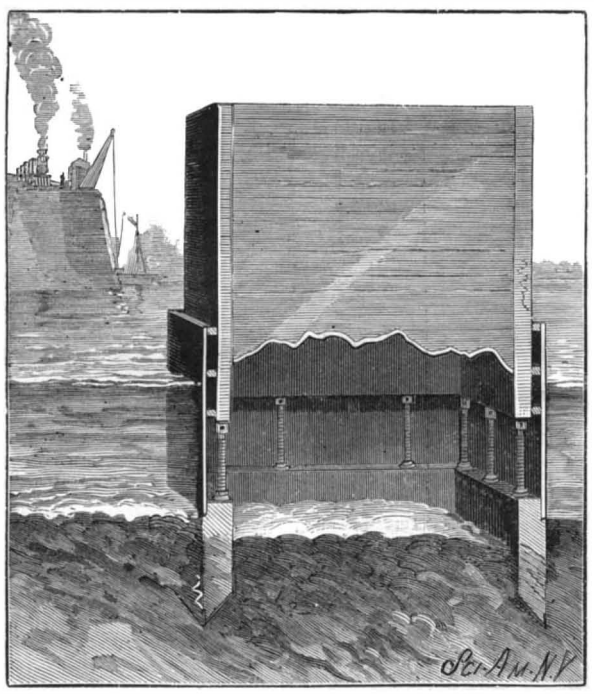
NEWCOMER'S IMPROVED EGG BEATER.

shaft is situated considerably below the upper edge of the pan, in order that a smaller whip may be used and yet have the same effect as a larger one. One end of the shaft rests in a bearing pendent from the frame, and the other end enters a box open at the upper end only, as shown in Fig. 2. That portion of the shaft within the box is provided with a small sprocket wheel, which is in gear with a larger one, on an independent shaft, by means of an endless chain. The independent shaft is furnished with a crank, by means of which the whip may be revolved. The box prevents the contents of the pan coming in contact with the chain or wheels. The apparatus requires but little effort to operate it, each revolution of the beater agitates or lifts the whole batch, and there is no danger of splashing.

This beater is manufactured by the inventor, Mr. J. L. Newcomer, 18 Water Street, Baltimore, Md.

IMPROVED CAISSON.

The object of the invention shown in the annexed cut—patented by Mr. John McGovern, of Murphys-



McGOVERN'S IMPROVED CAISSON.

borough, Ill.,—is to facilitate the work of sinking coal shafts and wells and excavating for bridge foundations in ground, such as mud or quicksand, which breaks into the excavation before it can be timbered. The lower portion of the crib or caisson is constructed of timber and of a size internally corresponding with the finished shaft. The lower portion is beveled to a sharp edge and shod with iron so that it will enter ground readily. The upper portion of the caisson, formed of boiler iron, is bolted to the outside of the lower part, and is long enough to extend some distance upward outside the permanent timbering of the shaft, so as to prevent earth from running into the excavated space at the bottom. On the inside of the upper part are ribs taking against the permanent timbering, thus insuring an equal space all around for inserting timbers. In using the caisson to sink a shaft, it is gradually forced down by jack screws, placed, as shown in the engraving, between the bottom portion and the lower course of the permanent timbers. After having been driven far enough to give space for a course of timber, the screws are removed, the material excavated enough to permit of the work, and the timbers then put in, after which the screws are again applied. The mud or sand is allowed to remain within the caisson nearly up to the top of the lower part, and only removed as necessary, so that the caisson will be held down to place.

The Novelties Exhibition, Philadelphia.

The Novelties Exhibition of the Franklin Institute will open on September 15, and will probably close the last of October. The building erected for the Electrical Exhibition, held by the Institute last fall, will do service in the present instance, and is expected to be well occupied, as the applications for space have already been quite numerous. The building is located at 32d and Lancaster Avenue, and is very convenient of access, being on the route of several lines of street railways, and but a short distance from the West Philadelphia station of the Pennsylvania Railroad. No applications for space will be received later than September 12, and the exhibitors are limited to the unique. It is to be eminently a display of novelties.

Each exhibitor must pay an entrance fee of $5 for his season ticket, and will be charged for the space occupied at a certain rate per sq. ft. Where power is required to drive the mechanisms exhibited, it is supplied at 3 cents an hour per horse power, and in case the exhibitor provide his own engine, the indicator card will decide the amount consumed. Judging from the past history of exhibitions in Philadelphia, it is expected that the coming one will be a great success.

Two Fine Meteors.

On the evening of July 6, about eleven o'clock, while engaged in comet seeking with the nine inch reflecting telescope, I was surprised by a sudden, almost blinding, flash of light. Quickly removing my eye from the telescope, and glancing upward, I beheld a magnificent meteor, moving rapidly from a point southeast of the zenith toward the northwest, and disappearing at an altitude of forty degrees. Just previous to its disappearance it burst into three or four fragments, which became of different colors, those in the rear being a vivid green, changing to purple, while the foremost and largest was a brilliant red. No report of the explosion was heard, although listened for. On the following night, in fact at one o'clock in the morning, while resting my eyes momentarily from the telescope, another fine meteor was seen moving from east to west across the northern heavens at an altitude of thirty-five degrees. This left a brilliant train of light lasting about 90 seconds, to the naked eye vision; and in the telescope, which was turned upon it, was visible a much longer time, twisting and curling like a wreath of smoke.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., July 8, 1885.

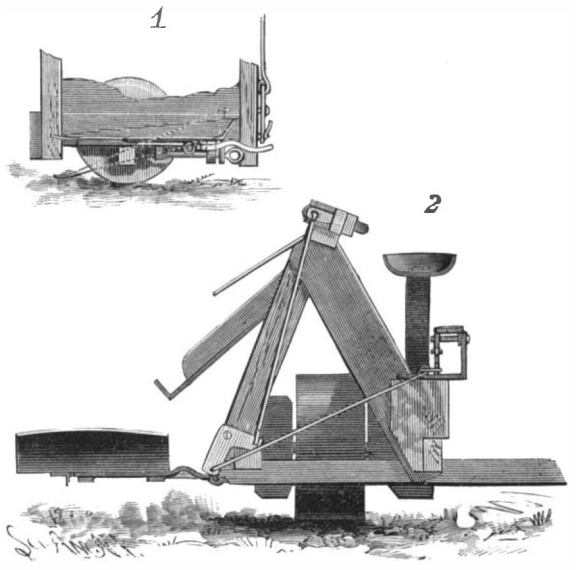
Tempering Steel with Low Heats.

Some curious statements on tempering steel are made in a paper published in *Dingler's Polytechnic Journal*, vol. 225, by Herr A. Jarolimek, "On the Influence of the Annealing Temperature upon the Strength and the Constitution of Steel." Hitherto it has been generally considered that to obtain a specified degree of softness it is necessary to heat the hard steel to a particular annealing color—that is to say, to a definite temperature—and then allow it to rapidly cool. Thus for example, that steel might anneal—be tempered—yellow, it had to be heated to 540 deg., and the supposition was formed and acted upon that it must be allowed only a momentary subjection to this temperature. Herr Jarolimek says the requisite temper which is obtained by momentarily raising the temperature to a particular degree, can also be acquired by subjecting the steel for a longer time to a much lower temperature. For example, the temper which the annealing color—yellow—indicates can be obtained by exposing the hard steel for ten hours to 260 deg. of heat; in other words, by placing it in water rather above the boiling point.

BUNDLE DROPPER FOR HARVESTERS.

We show, in the accompanying engraving, a bundle carrying and dropping device to attach to self-binding harvesters. Fig. 1 is a front elevation of the principal part of a self-binding harvester provided with this improved dropper attachment, and Fig. 2 is a section through the attachment parallel with the line of draught. The dropper consists of a fingered platform, with sides and front end, placed down to the stubble at the side of the binder, and pivoted to and supported by a triangular frame pivoted to the frame of the harvester; the triangular frame is supported by lever connections with the harvester frame. The only attention required to operate the device is simply to trip it by pressing a foot lever, when the fingered end of the dropper platform tilts to the rear, slides from under the collected sheaves, and when clear rises to its original position by gravity or a spring, and holds itself to receive the sheaves again without further aid of the driver. It is simple and light in construction, and in passing furrows or obstructions it rises and slides without danger of breaking. When necessary, it can be instantly detached, like a hinged gate, without disturbing the tripping device. The platform, being low down, gives all the room possible, and when the fall is two feet in the clear from the binder it will hold easily six or more sheaves.

In low delivery of binders, as now most used, as the rear figured end drops the front drops and tends to wedge the load of sheaves up against the binder, thereby obstructing the unloading; this difficulty is overcome by placing the pivot of the platform well to the front. The fingers are curved (more than is indicated in the drawing, Fig. 2), thus permitting the platform to be made shorter. This form prevents the sheaves—while collecting—from sliding off, and drops lower than the common style of fingers, thereby bringing the sheaves for one-half their length in contact with the



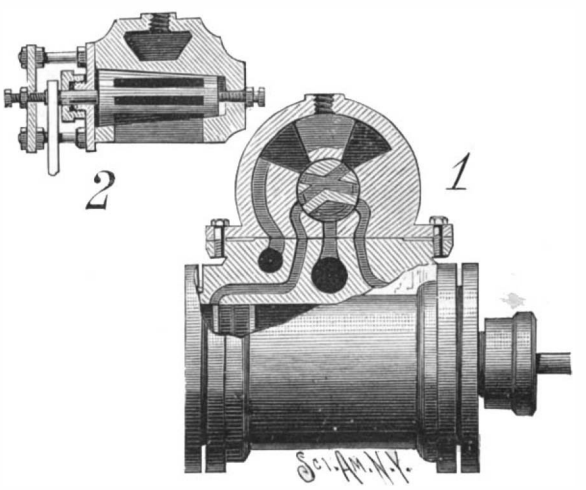
BELL'S BUNDLE DROPPER FOR HARVESTERS.

ground, and insuring the certain unloading of the platform.

This invention has been patented by Mr. Adam H. Bell, of Hillsborough, Ill.

ROTARY STEAM VALVE.

The valve case is attached to the engine cylinder, and is bored out centrally and longitudinally to receive the valve; it is provided with a removable head at one end to permit the insertion and removal of the valve. In the case above the valve is a steam space, a bridge at the middle of the space forming a bearing for the upper surface of the valve and a cut-off for the steam. (The passage supplying steam to the space and the ports are plainly shown in Fig. 1.) The valve is of tapering form, and is ground to its seat. It is made with transverse slots extending the length of the ports, and placed so as to connect the ports with the steam space; it is also made with an exhaust cavity on its under side. Formed upon the large end of the valve is a stem which extends through the removable head. To relieve the friction and allow endwise adjustment, the valve is supported at its ends by pivot screws, as shown in the longitudinal section of the valve and case, Fig. 2. By means of these screws the valve can be readily adjusted to compensate for wear. In case the valve should become, by wear, too small to fit



SYPHER'S ROTARY STEAM VALVE.

tightly, a thimble made with slots corresponding to the ports could be inserted in the case, and the valve then turned down to fit the thimble.

This invention has been patented by Mr. George W. Sypher, of Ellis, Kansas.

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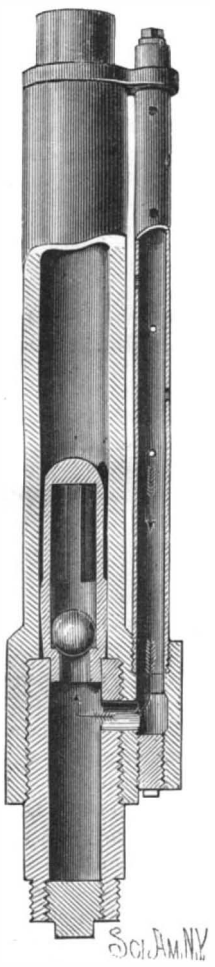
Recovery of Tin from Tin Scrap by Electrolysis.

The May number of the *Journal of the Society of Chemical Industry*, contains the report of a paper read before one of the meetings of the Society by Dr. J. H. Smith, describing a method suggested and used by him for working up tin scrap. After full consideration of other methods, Dr. Smith had come to the conclusion that electrolysis would be the most promising line on which to work. He states that he has since become aware that at least four English patents are based upon the same method, of which he was ignorant at the time. The scrap to be dealt with had, on an average, about 5 per cent of tin, and there was a supply of some 6 tons of such scrap per week, for which quantity the plant was arranged. It was designed to convert the tin into chloride of tin for dyers' use, the iron of the scrap being utilized as copperas. On the recommendation of Siemens and Halske. of Berlin, one of their dynamos, (C_{18}) was used, the machines of this firm being said to be very successful at Oker, in Germany, for the precipitation of copper. The machine in question is stated to give a current of 240 amperes, with electromotive force of 15 volts and an expenditure of 7 horse power. Eight baths were used made of wood lined with rubber. They were 1½ meters long, 70 centimeters wide, and 1 meter deep. The anodes were of course formed be the tin scrap, which was packed in baskets made of wood, and of a size to hold 60 kilos. of the scrap. There was an arrangement for constantly agitating these baskets by raising and lowering them, thus promoting circulation of the solution and regularity of action. The cathodes were copper plates, 1½ mm. thick, and 120 cm. long by 95 cm. broad. There were sixteen of these, placed two in each tank, one on each side of the basket. The electrolyte used was dilute sulphuric acid—commercial acid of 60° B., diluted with 9 volumes of water. The tin precipitated was rather over 2 kilos. per hour. It was very pure, easily melted when required, and in a form very suitable for solution in acid for preparation of tin salts. Dr. Smith, in his remarks, claimed for this process very considerable advantages over all the other processes proposed for getting back the tin from tin scrap, and gave figures to show that a profit could be obtained on the above basis. But his work seems to have been carried on where tin scrap was obtainable very cheaply. The price of collecting it and bringing it to the works would be very much higher in this country, and would eat up a large portion, if not all, of the expected profits.—*Engineering.*

PUMP FOR OIL WELLS.

The object of the invention herewith illustrated is to prevent gas from entering the barrel of oil well pumps, thus getting rid of the delays and trouble caused by the presence of the gas. The pump barrel, of suitable size and length, is formed at its lower end with a screw socket to receive a short tube whose outer end is closed by a plug. The upper end of the tube is adapted to receive the usual standing valve. Near its bottom end the barrel is bulged at one side, the bulged portion being bored out to form a chamber united with the interior of the barrel by an opening below the valve. The bottom of the chamber is closed by a plug, and into its upper end is screwed a tube that extends to the upper end of the barrel, where it is held by a ring. The upper portion of this tube is perforated to allow the oil to enter, thereby forming the intake pipe. By this construction the oil at the rock is excluded from the lower end, while the upper strata enters the perforations and passes down the intake, through the chamber, and up the barrel. The gas is not likely to go down the intake, as it has an opportunity to easily escape upward around the pump tubing to the top of the well. In addition the pump is less likely to take in sand than when the suction is at the lower end of the barrel.



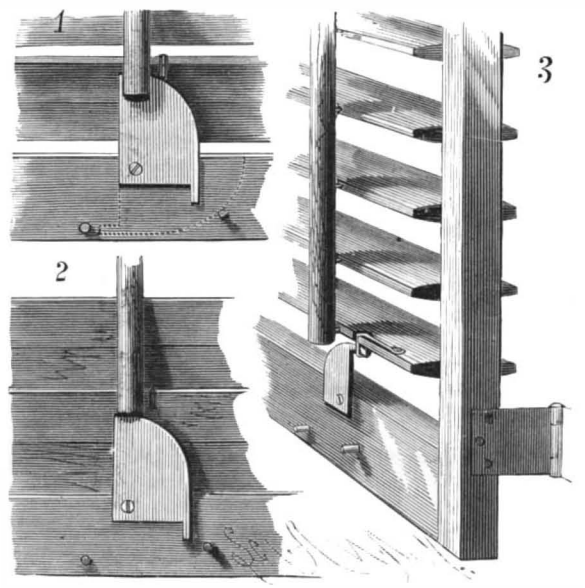
This invention has been patented by Mr. James M. Sanner, of Bradford, Pa.

THE greatest novelty in flowers this year is a tea rose of the most dazzling scarlet hue. It was originally grown in England, and has only just appeared in this country. It is attracting much attention among florists.

CHECK FOR BLIND SLATS.

Fig. 1 is a face view showing the slats held half open, Fig. 2 shows the slats closed, and Fig. 3 shows them fully open. The slat check consists mainly of a plate of wood or metal, made with one long flat edge, an opposite curved edge, and also with a projecting lip or catch, and pivoted to the rail below the end of the slat connecting bar. To the outer face of the lower slat is fixed at one end a spring wire catch, which extends toward the bar, and is bent in a loop at the free end, the loop passing through a slot in the slat.

When not in use the plate is set with its straight edge uppermost, as shown by the dotted lines in Fig.



RACEY'S CHECK FOR BLIND SLATS.

1, its curved edge resting against a pin set in the rail; the slats can then be moved freely. To hold the slats half open the plate is moved to the position represented in Fig. 1, when its end will stand between the lower slat and the connecting rod, and the slats cannot be moved either way from the outside. When the slats are to be held fully open the projecting lip of the plate is placed within the loop of the spring (Fig. 3) to lock the slats in the desired position. When the slats are to be held closed, the end of the plate is swung up under the connecting rod, as shown in Fig. 2. As will be readily understood, this check can be readily applied to either inside or outside blinds.

This invention has been patented by Mr. John Racey, of Quebec, Canada; further information can be obtained from Mr. John Williams, same address.

Study of Cast Steel.

La Metallurgie states that some interesting studies on the structure of cast steel have been made in the laboratories of Creusot by MM. Osmond and Worth. It was already known that cast steel consists of a kind of a cellular network of a carbide of iron, not easily attacked by acids, inclosing particles of soft iron easily attacked and dissolved. In order to examine this structure more closely, MM. Osmond and Worth prepared some very thin sheets from the samples to be examined, not exceeding two or three hundredths of one millimeter in thickness. These were attached to glass plates by means of Canada balsam, and then exposed to the action of dilute nitric acid, which dissolves out all the soft iron, and leaves the network of carbide in a form convenient for examination. It was found that the distribution of the network was not uniform; groups of carbide cells occur together, with spaces between made up of soft iron. The regularity in the diffusion of the carbide appears to influence the quality of the steel, as that steel which had been most worked was most uniform in structure.

Subterranean Telegraph Lines.

When the construction of the great trunk subterranean telegraph lines in France and Germany was entered upon, it was thought that owing to their depth underground, and their sheathing of metal in contact with the earth, they would be exempt from the influences of atmospheric disturbances. M. Blavier, the well known electrician, has nevertheless pointed out recently to the French Academy of Sciences, that in times of storm currents are produced in these lines, which discharge themselves through the lightning protectors, melting their fine wires. They are, however, less violent than the currents in aerial wires, and do not appear to interfere with the traffic. They are evidently due to storms in the country, at a distance more or less great from cities, where the lines are protected by systems of gas and water pipes. During a storm on March 9, at the middle of the line between Belfort and Besancon, sparks were seen at the terminal stations, whilst in the two cities hardly any atmospheric perturbation was noticeable. M. Blavier explains the phenomenon, which is familiar to those who have tested submarine cables in tropical seas, as due to electro-dynamic or electrostatic induction caused by the electricity of the storm.

Traffic of Broadway, New York.

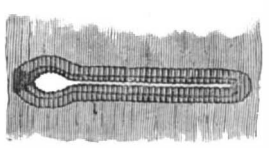
Four men were recently stationed at Fulton St. and Broadway to count the vehicles passing through Broadway at that point from 7 A.M. to 6 P.M. The total number was 22,308 for the period of 11 hours—about 2,000 an hour, 33 a minute, or 1 every 2 seconds. The largest number of any one kind of vehicles was of single and double trucks, 7,384; the smallest number was 2, these were ambulances. There were 3,390 single and double express wagons. The 2,310 stages and the 10,022 cabs were next in order of quantity, peddlers' wagons numbering 938, produce wagons 446, rag trucks 375, carriages 354, coal carts 324, and venders' wagons 300. Then there was a drop to hacks, 288, and butcher wagons, 223. The variety of vehicles was striking, there having been 80 kinds according to the schedule. Every conceivable article of transfer appears to be poured into Broadway. The private carriages were completely engulfed in the 150 ash carts; the 2 ambulances and 3 funerals made a melancholy showing amid the 73 loads of dead hogs, the 64 garbage, and the 73 dirt carts. The lager beer wagons and the orange peddlers flourished on an equality; the bone and lumber wagons went neck and neck; the pie and the sugar wagons were half and half, which should give the pies sweetness; the milk were left behind by the swill wagons. The mixture presented was, says the N. Y. *Tribune*, something appalling. Kerosene, milk, old iron, sawdust, rags, sugar, ice, beer, bones, oranges, ashes, pie, hogs, tripe, tin, tallow, tea, tar, and undertakers were commingled in a bewildering confusion. Broadway is certainly a remarkable thoroughfare.

Stereoscopic Effects by the Magic Lantern.

Mr. Crowther, of Manchester, has invented a contrivance for the production of stereoscopic effects by means of the magic lantern. Two lanterns are used, each of which projects one of the two corresponding stereoscopic transparencies so that one picture is superimposed upon the other upon the screen. The light thrown from the lanterns is not white, but consists of complementary colors, red and green. The observers wear spectacles colored of corresponding tints with those used in the lanterns, and each eye perceives only its appropriate view, the mind combining the two pictures into a representation possessing strong stereoscopic relief and some peculiar properties of luster. By a slight alteration in the adjustment the image can be made to advance and retreat, appearing suspended in mid air between the spectator and the screen, somewhat after the manner of the well known illusions produced by concave mirrors. The inconvenience of supplying colored spectacles to a company of observers can be overcome, it is thought, by paralysing each eye, as required, by alternately exhibiting a strong light of the complementary tint required. Mr. Crowther has also in progress a further optical contrivance for intensifying the stereoscopic effect when the landscape is viewed directly.

A BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

The accompanying figure illustrates a simple and strong method of making a button hole, as effected by sewing machines with the Harris button hole attachment, which has been the subject of two recently issued patents. By an intermittently rotated pinion and guide for retaining it in gear, combined with an oscillating and longitudinally movable feed bar carrying a cloth clamp, with other novel features, the ends of the button holes, as made, are strongly barred by a series of overlapping stitches, and the button hole is thus given extra strength, the whole being done quickly and automatically. Further particulars regarding these inventions can be obtained from the Harris Button Hole Attachment Co., of 521 West 45th Street, New York city.



James C. Lathrop.

Mr. James C. Lathrop, of Bridgeport, Conn., died on the 31st day of May, at the age of 33 years. Mr. Lathrop was well known to scientific men in the East, and was one of the most active members of the Bridgeport Scientific Society. As a mineralogist he was particularly well informed; his collection of minerals is said to be the most complete in the State, all his specimens have been carefully selected, and many of them are the finest of their kind. In other branches of science he was an enthusiastic student and teacher, whose influence was felt in the community. He was a good observer with the microscope, of which he made much use. For nearly twelve years he has been an accountant and cashier for the Housatonic Railroad Company.

It is seldom that a man in active business acquires such accurate and extended knowledge in science as Mr. Lathrop possessed. Naturally active and quick in thought and apprehension, by close application during the hours that could be spared from business and home duties, he became a leader among his associates, and an example worthy of imitation.—*Micro. Journal.*

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Correspondence.

The Paradise Fish.

To the Editor of the Scientific American:

In your paper of July 11, you print an article on the Paradise fish. The writer, in praising this really beautiful and interesting little fish, goes even so far as to "hope that they may be introduced into American waters."

Five years ago I imported six pair of two varieties of paradise fish (*Macropodus venustus* and *M. viridi auratus*). I have since that time raised many thousands of young ones from these, and am perfectly acquainted with their habits of nest building, their still more interesting ways of rearing their young, their fighting qualities, and also their diseases. I therefore hope that the Lord may prevent another experiment, which no doubt would prove as fatal to this country, as that made with the English sparrow. The Paradise fish are as fully, if not more, destructive to fish eggs, young fish, and fish food, than our native sticklebacks, darters, and the small varieties of sunfishes; they destroy without any other compensation than their beautiful colors and interesting habits, which, however, are only observable when the fish is kept in a glass vessel.

Those interested in this subject I respectfully refer to an illustrated article on the Paradise fish, printed August 11, 1881, in *Forest and Stream*.

HUGO MULERTT.

Cincinnati, O., July 13, 1885.

The Heat of Boiler Water.

To the Editor of the Scientific American:

In the article "Mechanical and Steam Engineering," by J. R. Williamson, in your issue of June 27, the writer makes the statement that "one cubic inch of water, with the requisite amount of heat, and at normal pressure, flashes into sixteen hundred cubic inches of steam, as would be the case in the bursting of a steam boiler (an expansion about the same as that of gunpowder)."

Admitting that a cubic inch of water will make sixteen hundred cubic inches of steam, and more, it is difficult to see where the "requisite amount of heat" is to come from, in the case of the bursting of a steam boiler.

To convert a pound of water into steam at atmospheric pressure requires 11,781 units of heat. Now, in case of the bursting of a boiler, the water can derive no more heat from its surroundings than the amount it actually contains at the time. In the case of a boiler working under the very common pressure of 90 pounds per square inch, or 75·3 pounds by gauge, the temperature of the water will be 320·2 degrees, and the number of heat units in [redacted]. A pound of steam at same pressure would contain, [redacted] its sensible heat of 320·2 degrees, a latent heat of 890·9 degrees, a total of 1211.1 units of heat. But we are considering a pound of *water*, not *steam*. We have found that a pound of water contains, at the pressure named, 320·2 degrees. Now, this number of degrees, minus its temperature at atmospheric pressure, or 320·2 – 212 = 108·2 degrees, is the total amount of heat available for converting the water into steam. As it requires 1178·1 degrees to convert all of the pound of water into steam, and there are only 108·2 degrees available, it will be seen that we have only a little more than one-tenth enough heat, or enough to convert about one-tenth of the water into steam. This would hardly make the expansion "about the same as gunpowder." How would Mr. W. like to "blow off" a boiler, or even open a gauge cock, if, instead of water at 320 degrees, gunpowder issued forth in the same bulk and exploded as it came?

Now, while I would not underrate in the least the great destructive force contained in the water in a steam boiler under pressure, if suddenly relieved of that pressure by the bursting of the boiler, I do not like to see statements which so much exaggerate the facts, or which cannot be verified by the accepted theories of heat and steam.

W. D. EVANS.

Le Sueur, Minn.

A Large Poplar.

In the Botanical Garden at Dijon there is a poplar of colossal dimensions (species not stated) to which Mr. Joly devotes a note in the *Journal de la Societe Nationale d'Horticulture*. The height of this tree is 130 feet. Its circumference near the earth is 46 feet, and, at 16 feet above the earth, 21 feet. Its bulk is now 1,590 cubic feet, but six years ago, before the fall of one of the large branches, it was 1,940. From some historic researches made by Dr. Lavelle, and a comparison with trees of the same species in the vicinity, it has been pretty well ascertained that this poplar is at least 500 years old.

Unfortunately, it is now completely hollow up to the point whence the large branches spring. All the dead portions have been removed, and the interior has been filled in with beton.—*La Nature.*

The Fastest Railway Speed.

There have been so many reports as to the speed attained by fast railroad trains, and the conditions under which such runs were accomplished, that it is pleasant to be able to give full official details of a train speed attained on July 9, over the West Shore Railroad, which at least seems to "beat the record," so far as this Continent is concerned. It was a special train, run from East Buffalo Junction to the New York terminus of the road, 422·6 miles, at the average rate of 54·06 miles per hour while the train was in motion, but the remarkable speed attained was in the run from East Buffalo to Frankfort, N. Y., a distance of 201·7 miles. This whole distance was made, excluding stops, at an average speed of 59·63 miles per hour. The fastest speeds were between Buffalo and Genesee Junction —60·9 miles in 56 minutes, or at the rate of 65¼ miles an hour, while the last 36 miles of the distance was run an the average rate of 72·6 miles per hour. These figures are from the train sheet, as furnished by Mr. W. W. Wheatly, the chief train dispatcher, but there were also on the train officials of the Baltimore and Ohio, Wabash, and Grand Trunk roads, some of whom kept a careful record, and reported that several miles were made in 43 seconds each. The train was made up as follows:

	Approximate weight.
1 N. Y., W. S. & B. baggage car	32,000 lb.
1 " " " private car (No. 90)	56.000 "
1 Baltimore & Ohio " "	56,000 "
Total weight of 3 cars	144,000 lb.
Tender 34,000 lb. empty; 20,000 lb. load (two-thirds of full load)	54,000 lb.
Engine (62,500 lb. on 4 drivers)	94,500 "
	148,500 lb.
Total weight of train	292,500 lb.

Details of engine, Class B, N. Y., W. S. & B. Ry.:
Cylinders, 18 x 24 in.
Drivers (4) 68 in.
Firebox (inside), 5 ft. 10⅜ in. x 2 ft. 10⅛ in.; 17 sq. ft.
Tubes, 188, 2 in. exterior diameter, 10 ft. 10⅜ in. long.
Heating surface, exterior tube area, 1,084 sq. ft., total 1,212 sq. ft.
Boiler, 56 in., average diameter, 17 ft. 6 in. extreme length.
Smokebox, extended. 6 ft. 2¾ in. x 59 in.

Flavoring of Spirits.

In a recent discussion on use of alcohol before the College of Physicians, Philadelphia, Dr. A. W. Miller said: In making whisky we use alcohol produced by fermentation of corn, which is the cheapest article from which it can be made in this country. This is passed through percolators containing charcoal, sometimes animal and sometimes vegetable, which absorbs all the fusel oil and coloring matters. When this process is carefully performed, we have an absolutely pure spirit, which is made of such strength as to contain 50 per cent of alcohol by volume. To flavor this we import from Germany, where rye whisky is one of the cheap- the oil of rye, which is there a waste product in tification of rye whisky. When this is dilute to a proper strength, it can be used as a flavoring material.

Brandy is made in nearly the same way. The flavoring material is obtained by distilling the refuse of the grapes from which the wine is made, with sulphuric acid. There is only one pound of this obtained from a ton of the so-called marc. When this is properly reduced, it may be used as a flavoring ingredient. These are not the only ingredients used in flavoring, but they are all harmless in the proportions used. Another of these flavors is acetic ether. This is also present in the natural product. The peculiar bouquet of high-priced wines is probably due to the presence of acetates, and to the products of oxidation of fusel oil, producing valerianic acid and subsequently valerianates of ethyl amyl. These are present in an infinitely small proportion. Artificial rye whisky contains only one part of amylic alcohol in ten thousand parts; brandy only one in fifty thousand. In addition to acetic ether, there is formic ether in brandy, and also butyric ether. All these things are used by confectioners in flavoring candies, and, as far as I know, no one has suffered from their use, although they are used in larger quantities. There is another point, namely that liquor dealers insist upon having a wholesome article, while confectioners are not so particular.

The cordials which have been shown are made from the rectified spirit, with the addition of aromatics and sirups.

The curacoa is almost an exact representative of the simple elixir of the Pharmacopœia. This is a very useful manner of administering a mild form of alcoholic beverage, and is to be preferred on account of having the sanction of the Pharmacopœia, and having a definite strength. This is another point in favor of artificial liquors. The rectified spirit always contains 50 per cent of alcohol. The natural liquors vary greatly, sometimes falling to 40 per cent, and sometimes, as in rum, reaching 75 or 80 per cent.

I might say here that the unpleasant taste of ordinary diluted alcohol is probably due to the amylic alcohol, which is more soluble in strong than in dilute alcohol. Not being thoroughly combined, it causes a disagreeable taste and odor.

The economical value of these substitutes has been referred to. The rectified spirit can be bought for $1.25 per gallon, and its therapeutic value is equal to that of brandy at $10 per gallon.

I have proposed the name *spiritus maydis rectificatus*, because it designates the particular kind of grain from which this alcohol is derived, and prevents it from being confounded with the *spiritus frumenti* which is now officinal.

As far as my experience goes, California wines and brandies are perfectly pure. Their low price offers no incentive to adulteration. It is well known that brandies from different localities have different flavors. The California brandy also probably never reaches the age of the French brandy.

Chloroform.

Chloroformum, methenyl chloride, terchloride of formyl, according to Wood, was discovered by Mr. Samuel Guthrie, of Sackett's Harbor, N. Y., in 1831. It results from the action of bleaching powder (chloride of lime) upon methyl or ethyl alcohols, or of chlorine upon marsh gas. It is a heavy, colorless fluid, practically uninflammable, but will burn with a greenish flame; its smell is powerful and agreeable; taste hot, sweetish, and aromatic; solvent powers extensive; specific gravity 1·525 at zero and boils at 62° C. (143·6° F.); insoluble in water, soluble in alcohol and ether; unaffected by concentrated sulphuric acid. There are two officinal forms—chloroformum venale and chloroformum purificatum.

Chloroform is introduced into the system through the lungs, the stomach, and the skin. Whether its action depends upon an altered condition of the blood or upon its direct action upon the nerves is not certain; it is more than probable that both theories are correct —upon the blood by increasing its carbon and rendering it thicker, and upon the nerves by its paralyzing effect. That it acts upon the blood by destroying its red disks in the body is proven by the appearance of icterus following its administration either by inhalation or by the mouth (L. Hermann, *Archiv fur Anatomie, Physiologie, etc.*, 1866).

Chloroform from its quickness of action and smallness of dose is superior for surgical and obstetrical purposes to any other anæsthetic, although it has an increased amount of danger over ether, nitrous oxide, and bromide of ethyl. Its mortality is 1 to 5·860, that of ether 1 to 16,542, that of nitrous oxide 1 to 100,000. It is not an agent to be used indiscriminately nor in the absence of proper antidotes.

Deaths are rather due to paralysis of the heart and respiratory organs. When administered internally the symptoms produced are of the same character, only more intensified and more lasting than those following inhalation.—*Llewellyn Eliot, M.D., Medical Record.*

Death of Dr. R. H. Gilbert.

The projector of the elevated railroad system, which has had such rapid and prosperous development in New York city, had almost dropped out of people's minds, until the announcement of his death, July 10, in his 53d year, recalled to the public the fact that the first of these structures was known as the "Gilbert elevated road." The Doctor had patented his invention, but was only able after years of labor to induce capitalists to invest enough to make an abortive attempt to put it in successful operation. This attempt, however, showing that trains could be run from Trinity Church to Central Park in sixteen minutes, gave an impetus to such enterprises which resulted in the present system of elevated railroads, which are now carrying 100,000,000 passengers yearly. The first enterprise was foreclosed on mortgage in 1871, but the Doctor received $100,000 in stock of the later corporations in compensation for his patent claims. He had been for some years in poor health, which impaired his mental as well as his physical faculties.

Refrigerating or Cold Air Machines.

The great advantage of ammonia, for refrigerating purposes, over ether, and more particularly over dry air, is that the required effect is gained by a smaller expenditure of fuel. Ammonia boils at a temperature of —30° Fah. at atmospheric pressure, and has a vapor tension of 120 pounds per square inch at 65° Fah. It has a latent heat (by equal weight) of 900. Ether, on the other hand, boils at 90° Fah. at atmospheric pressure, has a vapor tension of about 10 pounds, while the latent heat is, by equal weight, 162, and by equal volume, 369. Air, of course, is not condensable, and does not enter into the comparison on the same basis. Putting theory, however, on one side, Mr. Jno. Chambers, of New Zealand, states that his machine, which is designed to do the same work as a dry air machine delivering 60,000 cubic feet an hour, will work with about one ton of coal per 24 hours, while the air machine will require four tons for the same work. It will keep a storage space of 20,000 cubic feet, enough to hold 7,000 carcases of sheep, at a temperature of zero, and occupies an area of 306 square feet, the cubical measurement required being 2,295 cubic feet. At a higher temperature, say 15°, a larger space can be kept cool.

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BAILLEHACHE'S PRINTING TELEGRAPH.

The Baillehache apparatus differs absolutely from those of Hughes and Baudot, in that it requires, so to speak, no apprenticeship.

Now, for certain banking houses, like the Credit Lyonnais or the Societe Generale, which have continual correspondence between the main office and numerous branches scattered about the different quarters of Paris, a printing apparatus as easy to manage as the old dial telegraph of Brequet was a desirable thing. The houses that we have just cited, however, have now given preference to M. Baillehache's apparatus, which, in the accompanying engraving, is shown in operation in the Credit Lyonnais.

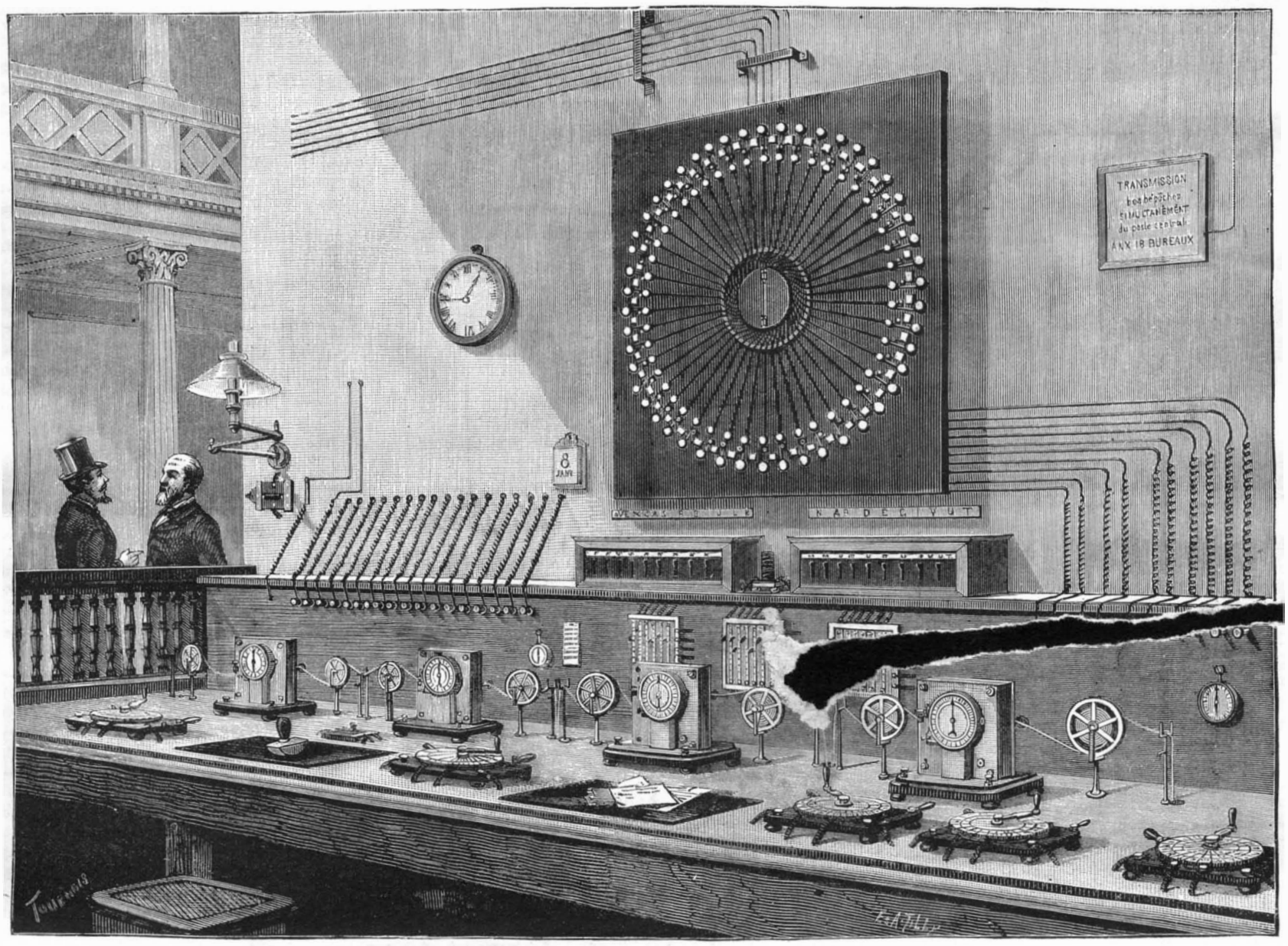
The station comprises a large switch board, the use of which is so well known in telegraphy that it is useless to dwell upon it. Beneath this there are two series of 9 cells each, each of which corresponds to a branch office. Beneath these cells there are three Swiss commutators that permit, through a plug, of connecting any of the apparatus with the station that is calling. This commutator likewise permits of connecting all the stations at once with a manipulator reserved for such a purpose. The utility of this latter arrangement is seen in the fact that twice per day the general office transmits the transactions of the stock exchange to its branches, and would lose valuable time in communicating it to them separately.

Those of our readers who are familiar with telegraphy will understand why it is important to have a separate manipulator for simultaneous transmissions. It is for the reason that, since all the stations are placed in derivation upon the same manipulator, it is necessary to employ a much more powerful battery for this special operation. This battery, which is placed in the cellar, is of 50 Leclanche elements, which are renewed every three months. The four receivers seen upon the table are quite analogous in appearance to the Brequet telegraph, and, if need be, can be used in exactly the same way. The elegant addition that Mr. Baillehache has made is of extreme simplicity, and therein lies its great merit. In the interior of the apparatus the axis of the needle carries a type wheel, so that, when the needle is upon any letter of the external dial, the type is at the lower point of the wheel.

The electro-magnet, instead of actuating a single pallet of soft iron, as in the Brequet apparatus, actuates two—one in front of and the other behind the electro. The front one is, like that of the Brequet apparatus, charged with the escapement of the needle's axis, but it differs therefrom in that, instead of being of soft iron, it is of magnetized steel, and that alternate instead of interrupted currents are sent by the manipulator. The play of the magnetized pallet is then in reality the same as in the Brequet apparatus, and the axis revolves in the same way. The second pallet, on the contrary, is of soft iron, and consequently remains attached to the electro every time the needle revolves by jerk.

As we have just seen, the Baillehache manipulator differs from the Brequet, in that it causes the pile current to alternate at every notch. It also possesses the peculiarity that as soon as the handle is placed upon the letter to be designated, the pile cnrrent is cut off, and, while the magnetized pallet remains adherent, the soft iron one detaches itself from the electro and presses the band of paper upon the automatically inked type wheel. The forward motion of the paper is effected through the second pallet and the general clockwork movement. When the needle passes to + the type wheel presents a notch that gives no impression; so the words are thus placed naturally.

The great merit of Mr. Baillehache's apparatus is that the employes of the offices do not have to undergo an apprenticeship in the use of it. As the number of dispatches to be sent is quite limited, the extra rapid instruments of Hughes, Meyer, and Baudot would have been absolutely superfluous.—*La Lumiere Electrique.*



THE BAILLEHACHE TELEGRAPH AT THE CREDIT LYONNAIS.

Has the Number of Bacteria No Limit?

Mr. J. D. Beck, of Liberty, Pa., sends a communication to this journal on the above subject. From it we take the following figures as computed by him: Mr. Beck finds a large number of bacteria in the sap from the sugar maple, "at least 500 in the field at one time." He estimates from this that there are 125,000,000 in a drop of the sap, and in a common gobletful, holding 3,000 drops, as many as 375,000,000,000. He further estimates that in the 500 gallons of sap boiled down by some farmers in a single day there are as many as 3,000,000,000,000,000. Thus he proceeds; but while it is remembered that any slight variation in the number first chosen makes a vast difference at last in the sum total, it is doubtful if any value can be attached to such figures, more than would come from the mental drill in computing the various amounts. It is of the same value that arises from computing the number of codfish there would be at the present time, if all the eggs should become fish, starting with a single fish only ten years ago. Naturalists say that this fish spawns 3,000,000 eggs in a single season. Starting with this as a basis we proceed, and we find that at the end of ten years the number of fish would amount to 214,449,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 millions of decillions. "Now suppose," says a recent author, "one hundred fish for each cubic foot, each weighing ten pounds, the cube, therefore, weighing 1,000 pounds—which is six times the weight of granite, three times the weight of lead, and nearly equal to the weight of gold—we should then have thirty thousand decillions of worlds the size of the earth, of the weight of gold, of nothing but codfish in ten years."

Our correspondent then proceeds to wonder whether it is not very injurious to health to drink such quantities of bacteria "as are found in all good well or spring water?" And he further asks if it would not be better to use distilled water with the necessary salts added to it which are lost in the process of distillation?

We reply by asking another question: Why is it that those parties entirely ignorant of the terms bacilli, micrococci, spirilli, and the like, eat, drink, and are merry, and enjoy such robust health that the bacteriologists would gladly exchange places with them?

All of which, and much more, leads us to observe that while the subject of bacteria opens up a large field for scientific research, and while great hopes should be entertained that much practical good will eventually result from such a study, in the prevention and cure of disease, yet, on the other hand, we should eat and drink, in blissful unconsciousness, whatever is set before us, and not worry over the results any more than we now worry for fear that in ten years the whole universe becomes one mass of codfish.

When we are told to "eat what is set before us, and ask no questions for conscience' sake," the writer evidently knew that, should our inquisitiveness be aroused, we would find ourselves surrounded by such bacterial questions that life would become simply unendurable.—*C. H. Stowell, The Microscope.*

Weight of Fast Trains.

Mr. J. O. Crawford, Superintendent, gives the following as the approximate weights of the fast trains on the New York division of the Pennsylvania Railroad:

	Pounds.
Engine, ready for service	96,700
Tender, ready for service	56,300
Two men on engine	300
One (1) combined car	30,000
One (1) parlor car	50,000
Two (2) passenger coaches	88,000
140 passengers, estimated	21,000
	342,300
Coal, estimated	5,000 lb.
Water	3,700 galls.
Average schedule speed, miles	48·01
Maximum schedule speed per hour, miles	55·08
Distance from Jersey City to Philadelphia, miles	89·06

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MACLAINE'S TWIN SCREW PROPELLERS.

The "perfect" twin propellers are being introduced by the Perfect Piston Company, of Belfast. The object of the inventor was to produce a system of propulsion which should be advantageously applicable to all sizes of vessels, and calculated to materially increase the safety and economy of maritime trading. The system is illustrated in the annexed engravings, where Fig. 1 shows an end elevation of the stern of a vessel fitted with Mr. MacLaine's twin screws, Fig. 2 being an underside view, and Fig. 3 a side elevation of the stern. These views are engraved from photographs of the model of a steamship 500 feet long and 50 feet beam, with a load draught of 26 feet. The twin screws are each 19 feet in diameter, overlapped 5 feet, and 11 feet apart fore and aft, and the ends of the blades project through two separate propeller spaces, each 6 feet by 16 feet, with a solid 4 feet space between them.

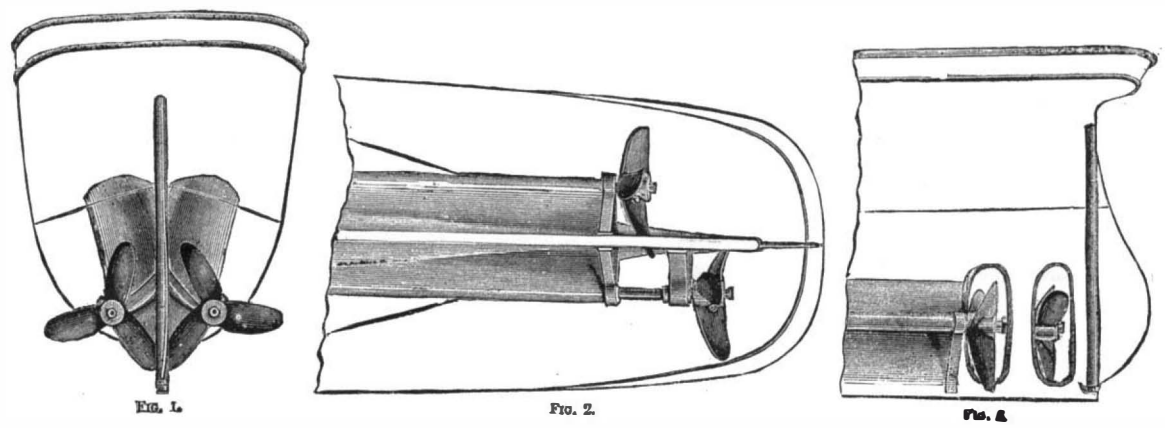

FIG. 1. FIG. 2. FIG. 3.

IMPROVED TWIN SCREW PROPELLERS.

By increasing the diameter of the propellers, together with overlapping them 5 feet and going forward 16 feet, the propeller shafting outside the hull becomes so shortened, and is brought so much nearer the center line, that it can be readily built into the vessel, and the stern tubes on both sides finished watertight up to forward propeller space, one shaft being continued aft to carry the after propeller, and be secured on a bracket placed on the solid 4 feet space between the apertures. The general result is that the propellers are so far distant fore and aft that the tips do not interfere with each other in their working, and the solid 4 feet space retains the body of the water from the forward propeller on its own side of the vessel, and prevents it interfering with the working of the other.

The propeller width is materially reduced, which facilitates docking; all brackets that might be damaged by floating ice are dispensed with, and all the dangers and difficulties of twin screw propulsion are avoided. In small vessels the propellers can be kept a few feet apart fore and aft, and the propeller spaces made merely sufficient to permit the tips of the blades to project through them, thereby enabling the diameters of the propellers to be enlarged to increase their efficiency. The system would appear to be well suited for tug boats, where it is desirable to have propellers of large diameter, with ample surface without extreme width over the propellers. In short, it possesses many advantages, and we hope soon to be able to report its practical application and the results of its working, which we hardly doubt will prove satisfactory.—*Iron.*

THE AMERICAN DICENTRAS.

This genus, which comprises about a dozen species, is chiefly confined to America; with us all the species are more or less hardy, and their foliage being graceful and almost unique, they have a fine appearance in borders and on rockeries. D. formosa eximia and the Chinese D. spectabilis might easily be naturalized on the margins of our woodland walks, perfect drainage being really the only essential toward their thorough establishment; thus used, they would fill up a gap between the daffodils and bluebells

D. canadensis (Squirrel Corn), though by no means common as yet in gardens, lacks none of the grace and beauty so characteristic of the allied species. It was at first believed to be only a form of D. eximia, which it resembles, but it is abundantly distinct, both in the color of its flowers and in the formation of its root stock; the scales, taking the form of grain, look not unlike yellow Indian corn. It is a valuable addition to the bog bed, where it succeeds well, provided it has a good rich soil and moisture during the growing season. The situation, though not exposed, should not be too shady, as this tends to the growth of leaves instead of flowers. The leaves, which are finely cut, are quite fern like. The flowers, which are borne raceme fashion, are nearly heart-shaped, and have short spurs; in color they are white or greenish-white, tinted with rose, and have a strong hyacinth fragrance. They are produced in April and May. It is found in woods from Maine to Kentucky.

D. chrysantha, figured in the "Flore des Serres," viii., 1,931, under the name of Capnorchis chrysantha, is an extremely handsome plant—indeed one of the most remarkable introductions of recent years in the way of herbaceous plants. Unfortunately, it gets disabled and even entirely destroyed in severe winters in the more northern parts of the kingdom. In the south, although it winters well in the open generally, it is all the better for the protection afforded by evergreen bushes, where, dotted about at intervals, it forms a striking feature; its large pyramidal spikes, rising up golden rod like, have a unique effect. It requires a light, rich soil, well drained, and the crowns should be well under the surface; a few large stones on each side of it greatly assist in giving the roots the desired warmth in spring. Where it does well it generally attains such dimensions that other plants get overcrowded by it. Plants of it raised from seed flower the second year; they may be kept through the first winter in pots, or when ready to handle they may be planted out where they are to bloom. Give it a slight protection during severe weather, and transplanting, except from pots if it can be avoided, had better not be attempted, as the result is oftener than otherwise a failure. It grows from 2 feet to 4 feet and even 6 feet high; the leaves are doubly pinnated, and the larger ones are over a foot long; they are pale or glaucous green, and are very pretty. The flowers, which are bright golden yellow, are about an inch long, and have beautifully curved or cordate bases. It commences to flower about the end of July, and continues into September. It is found on hills from Lake Co to San Diego, in California.

DUTCHMAN'S BREECHES (DICENTRA CUCULLARIA).

D. cucullaria (Dutchman's Breeches, or Hooded Fumitory), of which an illustration is here given, although oftener classed among curious and interesting plants rather than among those that are useful, is not to be despised when well grown as a rockery subject. Our experience with this plant has been varied; a half shady nook in pure peat seems to be the situation in which it feels most at home. It will be rarely found to do well in the open border without some protection; its slender leaves are invariably cut and destroyed by cold east winds early in spring. The scapes rise from a sort of granulated bulb, and bear from four to a dozen curiously hooded flowers, white, and invariably tipped with cream or pale yellow; the leaves, which have a glaucous green hue, are very delicate and pretty in outline. It flowers in April and May, and is a native of North America.

D. eximia.—This is a very ornamental plant, suitable for a small rockery, where its graceful, fern-like foliage never fails to attract attention, even without its handsome flowers. It will grow in almost any position, and in ordinary garden soil as well as in a peat bog. It makes a pretty clump in the mixed border, and, although liable to spread beyond bounds, a few pieces of slate will keep it in its place. It has a tendency, especially on the rockery, to run to the stones, leaving a blank in the center of the clump; this is, however, easily remedied by transplanting from the sides, which may be done in autumn without injury to the plant. The finely-cut divisions of the leaves are broadly oblong in outline, and glaucous if grown in full sun. The flowers, which are borne in clusters on compound racemes, are oblong in shape, with the crest of the inner petals slightly exserted; they are borne on stalks about a foot high. They are bright or deep rosy pink, and last from May until August. It is a native of the Alleghanies of Virginia.

D. formosa.—This plant is nearly related to the above, perhaps too near to bear a distinct specific name; the chief difference lies in its being dwarfer, and in having lighter colored flowers, and in its having a two instead of a four-angled stigma, as in eximia. D. formosa is easily managed, and may be grown with advantage in sheltered spots on the rockery. It makes a fine pot plant for edging stages, etc. It is a native of Sierra Nevada, where it is found at elevations of 3,000 feet. It flowers from May to July, the flowers appearing rather later than the leaves.

D. pauciflora.—This is a very slender species, not yet introduced. Its leaves are biternate, and have very narrow segments. The flowers are pure white, tinged with rose at the tips.

D. uniflora is a salmon colored species. Both are natives of California.—*K., in The Garden.*

Remarkable Salt Deposits.

At a recent meeting of the Royal Geographical Society, Sir Peter Lumsden read a paper on the countries and tribes he has recently visited west of Afghanistan. He gave an interesting description of the geography of the Murghab Valley and the customs of its people, and quoted a singular account of the Numaksar, or salt lakes of Yar-oilan, visited and described by Captain Yate. He said: "The valley of the lake from which the Tekke Turkomans from Merve get their salt is some six miles square, and is surrounded on all sides by a steep, almost precipitous descent, impassable for baggage animals, so far as I am aware, except by the Merve road, in the northeast corner. The level of the lake I made to be about 1,430 feet above sea level, which gives it a descent of some 400 feet from the level of the connecting ridge, and of some 950 feet below the general plateau above. The lake itself lies in the center of the basin above described, and the supply of salt in it is apparently unlimited. The bed of the lake is one solid mass of hard salt, perfectly level, and covered by only one inch or two of water. To ride over it was like riding over ice or cement; the bottom was covered with a slight sedi-

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ment, but when that was scraped away the pure white salt shone out below. How deep this deposit may be it is impossible to say, for no one has yet got to the bottom of it. To the east of the dividing ridge is the second lake, from which the Saryks of Penj-deh take their salt. The valley in which this lake is situated is much the larger of the two. The valley proper is itself some fifteen miles in length by about ten miles in breadth. The salt in this lake is not smooth, as in the other, and did not look so pure. It is dug out in flakes or strata, generally of some 4 inches in thickness, is loaded into bags, and carried off on camels for sale without further preparation."

The Ship Railway between the Atlantic and Pacific.

E. L. Corthell, C. E., contributes to *Science* an interesting paper, the object of which is to present the scientific and commercial reasons why the ship railway across the Isthmus of Tehuantepec may be superior to either the Panama sea level canal or the Nicaragua lock canal.

It is estimated that $50,000,000 will be ample to put the ship railway into operation for the transportation of vessels of 5,000 tons. The estimated cost of the Nicaragua canal on a cash basis is $140,000,000, and of that at Panama as high as $350,000,000.

The route *via* Panama, between Liverpool and San Francisco, is about 700 miles longer than by Tehauntepec; between New York and San Francisco, about 1,200 miles; and between New Orleans and San Francisco, about 2,000 miles. Probably 1,000 miles excess of distance would be a fair average.

The time in transit across the isthmus would be at least three days shorter at Tehauntepec than at Nicaragua for either a steamer or sailing vessel. The Suez canal, which is 100 miles in length, delays a steamer 48 hours in transit, or her passage is at the rate of about two miles per hour; two-thirds of the distance is through the lakes, and there are no locks. At Nicaragua, about one-sixth of the distance only is through an open lake; and there will be from twelve to twenty locks, at each of which a vessel will be detained nearly an hour. The time required for passage, therefore, will be about four days; so that, although the total distance is shorter than at Panama, the time required for a steamer would be about the same.

Reference has already been made to the favorable situation of Tehauntepec with reference to the trade winds.

It is also hoped that the maintenance will cost much less per annum than that of either canal. The Panama canal being below the level of the sea, with the slopes of its enormous cuts exposed to the wash of the tropical rains, the difficulty of removing the material washed into its prism, and the controlling of the Chagres River, make the maintaining of the ship channel difficult and expensive. At Nicaragua the conditions are nearly similar.

The ship railway will not be subject at any point to the ravages of floods. It will be built over its entire length, on the solid ground, with excellent materials at hand for construction and maintenance. On either side is a natural harbor, which with small expense, by the construction of jetties, will gives two excellent ports. The climate is remarkably healthy, and native labor abundant and cheap. It is located in a country which has a comparatively strong government.

The estimated total cost of maintenance and operation in lifting, hauling, and placing the vessel with its cargo in the water again, is less than thirty cents per ton of cargo carried.

The great doubt which must exist in the mind of the reader is in the practicability of lifting and hauling a loaded vessel. The method proposed is very briefly this: to lift the vessel by an ordinary lifting dock, distributing and equalizing completely the weight of the vessel by a system of hydraulic presses before the weight is brought upon the carriage which is to transport it. This is all done under the water as the vessel rises out of it, and in such a manner as to be perfectly safe and easy for the vessel. The weight is finally placed upon the carriage in such a way that there is no more weight upon one wheel, or upon one part of the carriage in its length or width, than upon another. The weight upon no wheel will be over eight or nine tons, although they will be tested to twenty tons when manufactured. The whole load is transferred to the wheels by means of powerful springs, which will also be tested to twenty tons, and none of which will have imposed upon them in practice a weight of over eight and a half or nine tons. These springs not only give a perfect cushion for the vessel and carriage while being transported, but also serve to take up any slight irregularities there may be in the track. The system of supports designed, and shown in the working model, gives an area of support under the vessel from fifty to seventy-five times as great as that in the best lifting dock in the world; and, moreover, these supports completely adjust themselves to the model of the vessel in each case. As it has been said frequently by practical experts in designing and building docks, and handling vessels in them, the desideratum is to have a sufficient number of adjustable supports, and this has been sought for in the plans for the work as shown in the model.

The railway road bed will be about 50 feet in width; the width between the outer rails, about 30 feet. There will be six of these rails, weighing from 100 to 125 pounds per lineal yard. All six rails will be connected by a long steel plated tie, set into two feet of broken stone ballast or concrete, as the case may be. The locomotive power as designed is to consist of engines of from 75 to 100 tons, each of which will haul at least 3,000 tons on a grade of as much as 40 feet to the mile; so that two, or at the most three, such locomotives will haul the maximum load. The grades are very light. Much of the line of railway is practically level. The maximum gradient, of which there is only one length of about 12 miles, is one per cent, or 52·8 feet per mile. The change between grades will be made by the ordinary vertical curve, but a very flat one—one that will change from a straight line two inches in 400 feet. The railway is practically straight, the minimum radius being 20 miles. The line as laid down on the isthmus has curves of from 20 to 53 miles radius. At five points on the line, in order to avoid heavy mountain cuttings or very high embankments, a change of direction will be made by floating turntables—a simple and economical device in first cost and operation, on which the vessels will be turned about while resting on a cushion of water. The whole line has been very carefully surveyed, and is practically located. Careful examinations have been made to ascertain the character of the foundations, both for the road bed and for the masonry structures. The result of these examinations shows that there is no bad or even questionable ground anywhere between the two termini. The accompanying map shows the topography of the country and the route of the railway, the river to be navigated, and the harbors on the two sides.

It will be seen from the foregoing that the vessel, when lifted out of the water, is really water borne on a system of columns of water under pressure, and that in the position given by this hydraulic system, she is transported across the isthmus. It will also be seen and appreciated by every person who is accustomed to travel on the ocean, that the strain to the vessel by the methods proposed can never be so great as that which she must undergo every time she goes to sea.

Industrial Notes.

To Coat Iron with an Impermeable Black.—Mr. Puscher, of Nuremberg, has devised a very simple process of giving iron and other metals a black coating resembling enamel, and one that is very even and regular, since it is not applied with a brush. *La Nature* describes it as follows:

Into a box about twenty inches in height is put sufficient powdered soft coal to cover the bottom to a depth of about three-quarters of an inch. About three-quarters of an inch above this is placed a grating, and upon this are laid the objects be treated. After closing the box hermetically it is placed over a fire. The moisture contained in the coal evaporates, and thick bituminous vapors are given off. The bottom of the box is kept at a dull red heat for about half an hour, and the box is then removed from the fire, and after a time is opened. The coal will be found to be converted into coke, and the objects lying upon the grating will be covered with a black layer resembling enamel, but more adhesive, and especially more elastic than the latter.

Articles thus treated may be bent and be exposed to great variations of temperature without the coating undergoing the least change.

Ebonizing Wood.—La Nature gives the following process for ebonizing wood: The wood to be treated is immersed in a solution of permanganate of potash for a length of time varying with the concentration of the bath, and is afterward dried. In this way a very beautiful tint is obtained, which becomes brilliant through slight friction, and which is due to carbonization of the wood. A weak solution gives a violet color.

Bleaching by Electricity.—According to the *Annales Industrielles*, Mr. Bonneville gives the following process for bleaching fabrics by electricity. Into a one per cent cold solution of bromine is put one per cent of caustic soda, or of any equivalent alkaline base.

The vegetable fabric, first thoroughly saturated with water, is then placed in this solution and allowed to remain therein until it is colorless.

It is afterward passed through acidulated water, and finally rinsed. One per cent of sulphuric or nitric acid added to the bath, after it has been exhausted by successive operations, suffices to liberate the bromine again. The same quantity of caustic soda is afterward added to again form hypobromite of soda. The hydrofluosilicic acid, during the formation of the bromides and bromates, gives an insoluble fluosilicate of soda, which is easily got rid of by decantation.

In this case there are neither sulphates nor nitrates mixed in the bath. If, in the solution, there be placed two carbon electrodes, connected with a pile, the active oxygen will be continuously renewed by the regeneration of the hypobromous acid. It has also been proved that a bath that is entirely exhausted can be regenerated by the passage of the current.

Mr. Bonneville, then, recommends the industrial use of bromine and the hypobromites for the bleaching of vegetable tissues, the regeneration of the baths by acids, and the restoration of the bleaching power by means of electricity.

Artificial Ivory.—Natural ivory being rare and insufficient, says *Le Genie Civil*, quite an extensive industry has arisen to supply an artificial substitute. The majority of the products formerly employed were obtained by injecting whitewood with chloride of lime under strong pressure. At the Amsterdam Exhibition almost all the products had been prepared with the bones of sheep and waste pieces of deer and kid skin. The bones are macerated and bleached for two weeks in chloride of lime, then heated by steam along with the skin, so as to form a fluid mass, to which are added a few hundredths of alum. The mass is then filtered, dried in the air, and allowed to harden in a bath of alum. In this way there are obtained white, tough plates, that are more easily worked than natural ivory.

Soldering Platinum.—La Lumiere Electrique gives the following description of the process employed by Mr. Pratt for soldering platinum wire, crucibles, etc. Perchloride of gold ($AuCl_3$) is slowly heated up to 200° C. with an ordinary gas blowpipe, so as to obtain chloride of gold, then to a higher temperature in order to obtain metallic gold, which flows between the two surfaces which are to be united, and which have been previously juxtaposed.

The soldering is rendered complete by hammering while still hot. Mr. Pratt has found this method far preferable to the one that consists in the use of fine gold wire.

Comparative Cost of Fuels.

At a recent meeting of the Engineers' Club of Philadelphia, the secretary presented, for Mr. James Beatty, Jr., a paper upon the Relative Costs of Fluid and Solid Fuels. After giving the relative advantages in economy of labor in use, reduction of weight and bulk, ease of manipulation of fire, perfection of combustion, and cleanliness, the principal substances, experiments, and processes are noted.

Notes and tables are given as to the compositions of different fuels, their heat units and evaporative capacities, efficiency in furnace, prices per unit, and pounds of fuel for $1.00 and pounds of water evaporated from 212° F. for $1.00, in various localities.

The paper concludes with the following table, of which the author says: "These figures are very much against the fluid fuels, but there may be circumstances in which the benefits to be derived from their use will exceed the additional cost. It is difficult to make a comparison without considering particular cases, but for intermittent heating, petroleum would probably be more economical, though, for a steady fire, coal holds its own."

RELATIVE COSTS OF FLUID AND SOLID FUELS.

	Anthracite.	Bituminous.	Petroleum.	Coal Gas.	Generator Gas.	Water Gas.
New York	1·00	1·08	1·71	14·92	22·90	8·70
Chicago	1·00	·71	1·50	8·72	18·30	7·00
New Orleans	1·00	·59	1·56	17·90	15·30	5·80
San Francisco	1·00	·64	1·50	8·75	9·40	3·50
London	1·00	·61	2·05	7·16	17·70	6·30
Port Natal	1·00	·90	1·21			
Sydney	1·00	·34	1·39			
Valparaiso	1·00	·44	1·03			

Aerial Warfare.

In a lecture recently delivered in London, Prof. Gower suggests a plan of aerial warfare after this pattern: Could armies, forts, and arsenals be seriously assailed from that quarter in which attack was not now expected—the air above? His belief, from four years of study and observation, was in the affirmative, and as a means to that end he proposed simply to transfer to the upper levels the general plan of torpedo warfare, upon a larger scale and with its effective range indefinitely extended. He suggested that by means of aerostats explosions of 100 pound shells of gun cotton might be arranged over the enemy's position. Summarizing his proposals, the lecturer said: "In brief, I propose to you a warfare by gun cotton and hydrogen, to make the loss of an army a result of its meeting an opposing wind, to destroy the security of fortified positions, and finally to show, upon the simplest principles of self-preservation, that nations must keep peace and great armies be disbanded."

THE interest factor is one of the most potent features in all business transactions. Money will double itself at ten per cent in about seven years, at nine per cent in eight years, at eight per cent in nine years, at seven per cent in ten and a half years, at six per cent in twelve years, at five per cent in fourteen years, at four and a half per cent in sixteen years, and at four per cent in eighteen years.

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THE HOUSES OF PARLIAMENT.

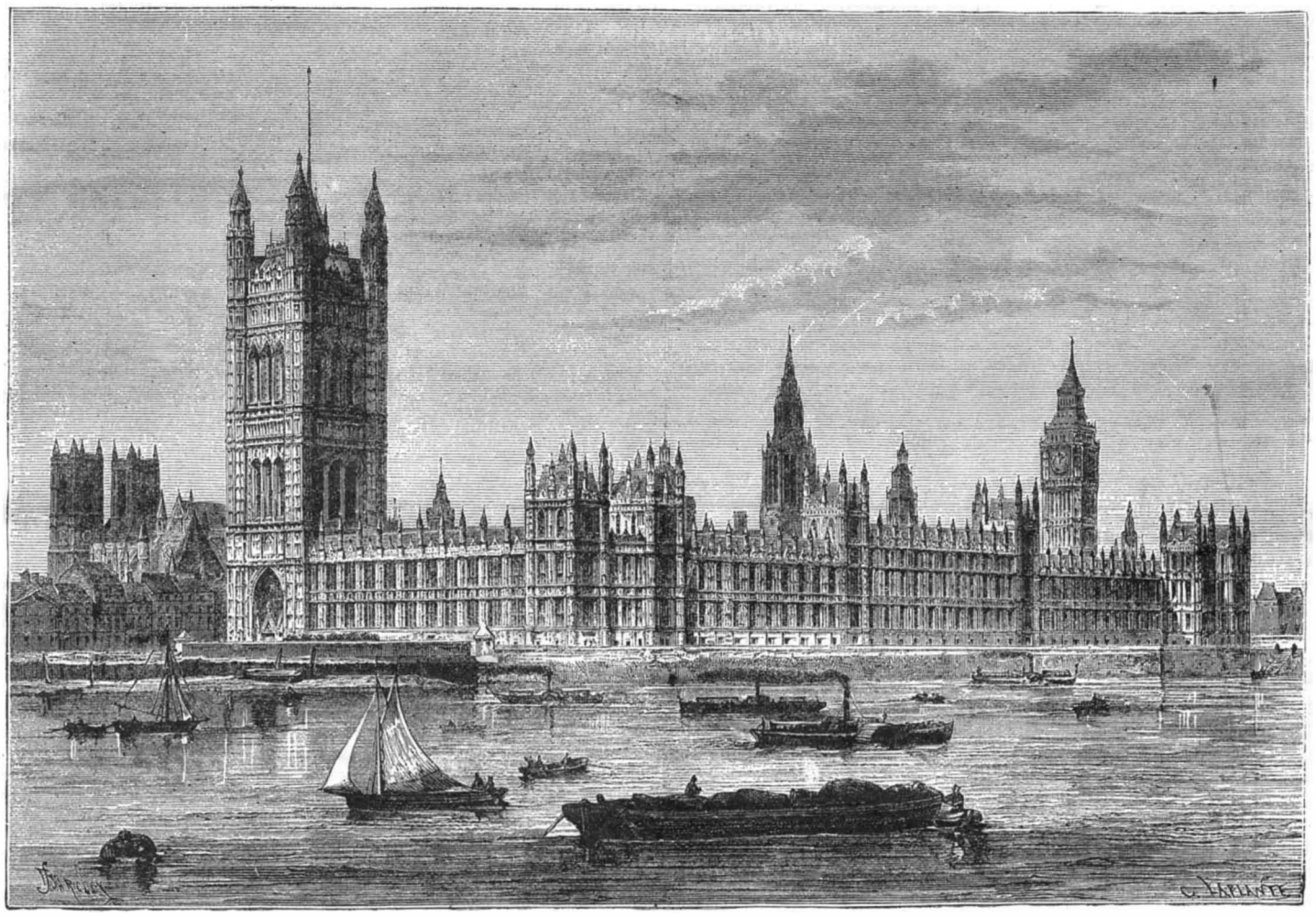
The Houses of Parliament, or the new Palace of Westminster, are among the most famous buildings of London, or indeed of the world. They are located on the left bank of the Thames, between the river and Westminster Abbey, and immediately above the Westminster Bridge. They occupy the site of the old palace, which was destroyed by fire in 1835, and cover altogether an area of about eight acres. The buildings, erected at a cost of $3,000,000, are in the Tudor-Gothic style, and contain 1,100 apartments, 100 staircases, and two miles of corridors. Our illustration shows the very ornate and effective facade, which is toward the river. The clock tower, 320 feet high, is at the northeast corner of the building, and strongly resembles the clock tower at Bruges, so well known through Longfellow's poem. The belfry is 40 feet square, and has dials on its four sides 30 feet in diameter, while those of St. Paul's are but 18 feet. The great Stephen bell, cast in 1858, weighs over eight tons, but is, unfortunately, defective in tone.

The central spire rises above the main dome to a height of 300 feet. At the southwest corner the Victoria Tower, 340 feet high, surmounts the royal entrance.

The House of Peers is located in the western portion of the building, and is 100 feet long and 45 feet in width and height. It is one of the most gorgeous legislative halls in the world, and contains the throne, a chair for the Prince of Wales, and the woolsack for the Lord Chancellor. The stained glass windows are lighted at night from outside.

The Queen's robing room, decorated with frescoes from the legend of King Arthur, faces the river, and is separated from the Victoria Tower by the Victoria Gallery and the Prince's Chamber. Since the gunpowder plot of 1605 a thorough examination of the cellars is made whenever the royal presence is expected. In the center of the building, St. Stephen's Hall is built above the ancient crypt of St. Stephen, the only relic of the old palace, which has now been restored and is used as a chapel. The hall is of noble proportions, containing twelve statues of illustrious statesmen, and separates the House of Peers from the Commons. This is located in the eastern portion of the building, and is much less ornate than the upper house. It occupies the site of old St. Stephen' Hall, and is 60 feet long, with a height and width of 45 feet. The Strangers' and Speaker's galleries (the latter for distinguished visitors) face the Speaker's chair, and are in front of the reporters' gallery.

The foundation stone of this vast pile was laid April 27, 1840. The chief architect was Mr. Barry. In spite, however, of the great expense and the many years consumed in their erection, the constructive features of the British Houses of Parliament are even more unsatisfactory than those of our own Capitol. While we have washed our marble columns with oxalic acid, in the vain hope of making them white, and have even been under the necessity of painting them, the English are forced to note, with considerable uneasiness, the decay of the outside stonework and the rapid deterioration of the interior frescoes of their legislative halls, and must give untiring attention for their preservation.



THE BRITISH HOUSES OF PARLIAMENT, LOOKING NORTHWEST.

AN American medical missionary, Dr. Allen, who settled some time ago in Seoul, the capital of the Corea, has commended his cause to the authorities so much by his skillful treatment of numerous officials who were wounded in the recent insurrection, he himself remaining at his post when all other foreigners had removed out of danger, that the government is now going to establish a hospital for him.

Loss of Weight in Coal by Storage.

In the course of a paper read at the late meeting of the Ohio Gaslight Association, the President (General Hickenlooper) gave the results of some experiments made by him to ascertain the loss in weight suffered by coal by storage. A certain number of pounds of coal were put into a box open at the top, with lattice work sides, and placed on a loft over a stack of benches; an equal weight of coal was placed in an open shed in the yard; while a third portion of coal was filled into a box similar to the one above described, and placed in a convenient situation on the top of the tank wall of one of the gasholders. After a year had elapsed the coal was reweighed. That near the stack had lost 11 per cent; that in the shed had decreased 10 per cent; and the third portion (that on the tank wall), greatly to the surprise of the gentleman who had charge of the experiment, showed a loss of only 1·74 per cent. General Hickenlooper thought the last result might, in great part, be attributed to the fact that, just before the reweighing, there had been a heavy rainstorm, although there was no extraneous appearance of moisture about the coal. A fourth portion of coal, taken from a coal "wall" on the river bank, where it had been exposed to the action of the elements for about three years, showed a loss of 13 per cent. It appeared rather strange that, of the three first-mentioned lots, the one on the tank wall—the most exposed situation—should develop the least percentage of loss; yet such was the fact. Of course, there must have been somewhat contradictory conditions at work, since the specimen from the river bank had lost 13 per cent. The three portions were of identical quality, taken from the same mine.

Observation on Tree Growth.

An interesting observation on tree rings is recorded by Professor Bachelant. During a visit to the ruins of Palenque, Mexico, in 1859, M. Charnay caused all the trees that hid the facade of one of the pyramids of the palace to be cut down. On a second visit in 1880, he cut the trees that had grown since 1859, and he remarked that all of them had a number of circles greatly more numerous than their age would warrant, supposing one circle only to be added annually. The oldest could only have been twenty-two years of age, but on a section of one of them he counted 250 circles. The tree was about two feet in diameter. A shrub not more than eighteen months old had eighteen concentric circles. M. Charnay found the case repeated in every species and in trees of all sizes. He concluded that in hot and moist climates, where Nature is never at rest, trees may produce, not one circle in a year, but one in a month. The age of a monument has often been calculated from that of trees that have grown on their ruins. For Palenque 1700 years had been calculated, 1,700 rings having been counted on a tree. These observations, however, require the number to be cut down to 150 or 200 years. Prof. Bachelant asks if M. Charnay took account of certain colored rings which some tropical trees present in cross section, and which are to be distinguished from the annual circles.—*The Garden.*

Electrical Lamps for Fire Arms.

At the meeting of the Paris Academy of Sciences, July 6, G. Trouve described two new applications of electricity, which relate to the firing of arms at night. The first consists of a luminous electric button; and the second, of a powerful electric projector. These two devices are removable, and they can be applied instantaneously to any ordinary arms; to guns used for hunting as well as to weapons of war; to mitrailleuses, as well as to cannon, in fact, to any fire arms. Their function is automatic.

The electric button is the size of an ordinary metallic button, and consists of a fine platinum thread introduced into a little glass tube, which is, in turn, protected by a metallic tube. An opening is left in the metallic tube, by which to take aim, but said opening is so arranged that the luminous button is visible to the person using the gun only, and cannot be seen by the enemy. The button is operated by Mr. Trouve's reversible, hermetic pile, presented to the Academy of Sciences, by Mr. Becquerel. This pile, which is about as large as the little finger, can be secured to the barrel of the gun, parallel with the same, by means of two rubber bands. The hermetic pile operates only when placed on its side, that is, horizontally; therefore, it will be seen that when the person using the gun places his weapon in position for firing, the pile immediately begins to operate and illuminates the button; and that when the gun is held upright the pile ceases to operate, and the button is no longer luminous. The light given by the button is sufficient for taking aim, but cannot be seen by a person standing three feet from the gun. This is, of course, a great advantage, it being very difficult to take aim correctly in the dark.

The luminous electric projector consists of an incandescent lamp and a little parabolic reflector, or of an incandescent lamp and a concentrating lens enclosed in a metallic tube. The apparatus is to be applied to the end of the barrel of the gun, parallel to the same, by means of two elastic bands. It is put into operation by pressing the butt of the gun against the shoulder, and, by its use, the point to be struck can be lighted, and, if it moves, all its movements can be followed. The generator of electricity to be used for this apparatus is the same as that used for the safety lamp invented by Mr. Trouve, and recently presented to the Academy of Sciences by Mr. Jamin. It can be worn in the belt, and its action is automatic.

The services which these two apparatus are capable of rendering to armies and navies are numerous, but the great advantage which they offer is that they make it possible to aim as correctly at night as in the daytime.

Artificial Oil of Lemon.

By treating the rectified spirit of turpentine in the following manner curious chemical changes take place: Spirit of turpentine, 2 quarts; rectified alcohol, 3 pints; nitric acid, 1 pint. Agitate the mixture in a glass or earthen vessel and allow it rest. After one month the reaction will be complete, and a large quantity of hydrate of spirit of turpentine is obtained. This hydrate, mixed with alcohol, produces voluminous crystals. Submitted to the action of hydrochloric acid gas, the hydrate of turpentine loses a part of its water of crystallization, and is transformed into a hydrochlorate, having all the properties of the *camphor of lemon.* When heated it loses part of its acid; then treated by potassium, it is transformed into a fluid colorless oil, possessing the odor and chemical properties of the natural oil of lemon.

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ENGINEERING INVENTIONS.

An air motor has been patented by Mr. Alois M. Koniakowsky, of Ellingen, Tex. It consists of an engine, single-acting air pump, receiver, double-acting exhaust pipe, with levers, valves, connections, etc., forming a motor to be operated by compressed air.

A mechanical stoker has been patented by Mr. James Hodgkinson, of Manchester, Eng. It has an ordinary hopper opening into a crusher box, with improved rotating helical crusher and adjustable flexible spring plate for crushing, measuring, and delivering fuel to the distributer, whence it is automatically scattered over the fire.

A car coupling has been patented by James Barry, of Willmar, Minn. Shafts are journaled, in combination with the drawhead, on the end of the car, levers being pivoted to the sides of the car, and rods connecting the levers with cranks on the ends of the shafts, a rod connecting the crank of each shaft with the lever at the same side of the car at which the crank is located with other novel features.

A lubricator has been patented by Mr. Peter Barclay, of Boston, Mass. This invention covers improvements in a lubricator for engines, etc., formerly patented by the same inventor, and instead of an intercepting perforated plate a perforated coil is used, giving increased condensing surface; for downward-drop lubricators, also a diaphragm is so arranged near the bottom of the glass tube that the oil cannot be thrown back on the glass by the pulsations of steam in the engine.

AGRICULTURAL INVENTIONS.

A hay gatherer has been patented by Mr. James H. Poage, of Monroe, Mo. It has teeth connected by cross bars and provided with a reversible tongue, the latter so connected with the rake that it may be readily reversed, so the gatherer can be drawn back from collected hay without its being necessary to back or detach the team.

A plow has been patented by Mr. Chas. Atkinson, of Chicago, Ill. It is an improvement on a former patented invention of the same inventor, and relates to the construction of the wheels, axle, and guiding mechanism, the revolving cutter mountings, the contrivances of the subsoil attachment, and in some guide and cutter attachments to the plow.

A seed planter has been patented by Mr. Augustus E. Choate, of Cochran, Ga. Spring bars, with coverer arms and plates, are attached to the frame of the planter, with other novel features, making an attachment calculated to ridge the earth over the seed sufficiently to obviate the first plowing usually required for that purpose after the use of the ordinary board coverers.

MISCELLANEOUS INVENTIONS.

A design for a pedestal or stand has been patented by Mr. Richard M. Hunt, of New York city. The design is that adopted and now being used for the Bartholdi statue, but is also appropriate for use in smaller dimensions for other monuments or for various ornamental uses.

A gridiron has been patented by Mr. Charles M. Cooke, of Brooklyn, N. Y. It is for an attachment to a range or cooking stove, and has novel features affording particular convenience, while the escaping odors are prevented from escaping into the room, but are returned to the fire for consumption.

A printing machine has been patented by Mr. Philip Jackson, of Plainfield, N. J. This invention relates to two-revolution printing presses, and covers a special construction and arrangement of parts to cover the raising of the impression cylinder during the return of the type bed.

An adjustable finger ring has been patented by Mr. Frank N. Foster, of Duluth, Minn. Combined with a gem frame or center piece is a bow or circular band, the ends of which are pressed into the ends of the frame, while there are cams pivoted in the ends of the gem frame for locking the ends of the bow therein.

A lathe chuck has been patented by Mr. Edward Pement, of Esmond, Dakota Ter. This invention covers a special construction, arrangement, and combination of parts for a face plate and chuck attachment, which is intended to enable the operator to bring any point on the face of his work to the center very easily and rapidly.

A parabolic railway and car have been patented by Mr. Moritz Geber, of Berlin, Germany. Combined with parabolic rails is a hinged platform with a hook and a hoisting or lifting device for raising the free end of the platform, for improving the mechanism for starting the cars and promoting the efficiency of gravity railways.

An adjustable double bedstead has been patented by Mr. Albert T. Schlichting, of New York city. Combined with a bedstead is a vertically adjustable frame above it, with devices for raising and lowering the upper section or frame and locking it in place, so as to form one or two bed supports, one above the other.

A drive chain has been patented by Mr. William Stephens, of New Richmond, Wis. By this invention drive chain links are so made as to be adapted to be separated from each other, the construction being such that the links may be locked to and unlocked from each other only when brought to a certain unusual position.

A watch case has been patented by Mr. Wiliam Carpenter, of Salida, Col. Combined with a watch case is a movement-holding band or ring and a link hinged to the case and to the said band or ring, making an improved watch case with dust proof joints, the object being to facilitate placing and adjusting the works in the case.

A method of drying grain has been patented by Mr. David M. Bunnell, of Brooklyn, N. Y. The invention consists in applying a blast of heated air to the interior of a mass of moving grain and driving off the moisture arising therefrom by a blast of air admitted above the grain, thus facilitating the drying and cooling of malt, grain, and other substances.

A baling press has been patented by Mr. Charles Smith, of Marquette, Mich. In combination with the press sills and follower are tubular shafts with ratchet wheels, gear wheels with spring pawls engaging with the ratchet wheels, means for operating these, and so the follower can be readily drawn down to press the material into a bale, the invention being designed to simplify the coustruction and promote the efficiency of such presses.

A wheel or pulley has been patented by Mr. George P. Clark, of Windsor Locks, Conn. It is made with side plates and penetrating points to enter the material composing the body or wearing surface of the wheel, which is supposed to be of paper, leather, rubber, or similar material, or having tires or outer wearing surfaces made of such material, the sheets of which are so compressed as to become a solid and nearly homogeneous mass, the outer edge, or wearing surface, being turned or worked down as required.

An adding machine has been patented by Mr. William J. Macnider, of Greensborough, Ga. Combined with a series of counting wheels is a toothed wheel adapted to engage therewith, and mounted on a shaft with one end journaled in a swinging standard, the latter connected by a suitable lever with a push pin, by means of which the toothed wheel can be swung toward and from the counting wheels, with other novel features, for rapidly and accurately adding columns of figures.

A calculator has been patented by Mr. Jules V. Charpantier, of New Orleans, La. This invention consists in a series of tabulated cards, a rotary slotted screen, and a box therefor, so made and combined as to form a device by which can be shown at a glance the date of maturity of any note or draft, etc. The same inventor has likewise obtained a patent for an apparatus for facilitating the multiplication of numbers, by which a table of figures is formed in sections, separately placed upon rollers within a box, the figures being so arranged upon the table that when a row of numbers to be multiplied is registered or brought to the front of the box by moving the rollers, the result of the multiplication of this row of registered figures by each of the numerals from 2 to 9 appears simultaneously on the table at the front of the rollers.

A holdback for vehicle shafts has been patented by Mr. Daniel T. Chambers, of Mechanicsburg, O. It consists in a triangular shaped piece of material, with a hole through it, so applied to the shaft as to form a simple and secure attachment of the breeching of the shafts, avoiding the chafing of the strap and shaft, and being cheaply made and easily applied. The same inventor has likewise patented an improved holdback for harnesses, combining with the carriage shaft a ferrule with a flange, a shaft tug attached to a girth and to a saddle strap of the harness, a tang secured to the tug, and a holdback strap connecting the tang with the breeching of the harness, the device being self-attaching and detaching, and such as will avoid rattling and unnecessary wear on conspicuous parts of the gear.

NEW BOOKS AND PUBLICATIONS.

A HISTORY OF THE PEOPLE OF THE UNITED STATES, FROM THE REVOLUTION TO THE CIVIL WAR. By John Bach McMaster. Vol. II. New York: D. Appleton & Co., 1885.

Three years have now passed since the appearance of the first volume of Professor McMaster's history, and the lively interest which it excited has secured in advance a warm welcome for this second installment of the work. The present volume covers the period from 1790 to 1803, and contains in its seven chapters a wonderful store of curious information in regard to life and society as it existed under the early administrations. It is eminently a history of the people, and in reviewing the events of these important years, it is always their sympathies and prejudices which are brought forward and are kept in view. The historical outline presented is indeed only a background against which to picture the social life and sentiment of the new republic. Covering, as it does, the experimental years of the Constitution, the field susceptible of such popular treatment is particularly engaging. The now almost forgotten customs of our ancestors, their inexperienced criticisms upon the measures of the general government, and their outspoken distrust of the reputed monarchical tendencies of the first cabinet form the material for very entertaining chapters. At so formative a period in the national development, when there was open contest between Congress and the States, when the group of undoubted aristocrats gathered around Hamilton were in direct opposition to the extreme republicanism of the circle which acknowledged Jefferson as its chief, the dominance of English or French influence was an element of great moment to the future of the nation. This phase in the national growth has been admirably handled by Professor McMaster. He has also taken considerable pains to inform us in regard to the origin of a number of our more popular ballads and of such expressions and phrases as have a recognized value in our vocabulary. The famous cry of the French revolution, "Ca ira," which originated with Franklin, is traced through its history. The account of town and country life as they were at the beginning of the century, and of the growth of those social usages which we have come almost to regard as instinctive, are also very readable and instructive. In conclusion, we can only say that Professor McMaster has rendered an important service to the descendants of those people whom he has so gracefully chronicled, and the mental history which he has traced will be a contribution of permanent value to the national literature. The general character of the author's work is always excellent, and the reader cannot fail to be impressed with the evidences of a most praiseworthy thoroughness and care which are everywhere manifest. The volume closes with the negotiations which led to the Louisiana purchase, and leaves three more installments yet to come before the work is completed.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted.—An interest in Brick Machines, dry compress method preferred. Address D. E. Ryan, 408 Broome Street, New York.

The "Improved Green Engine" Automatic Cut-off. Providence Steam Engine Co., R. I., *Sole Builders.*

Manufacture of Soaps, Candles, Lubricants, and Glycerine. Illustrated. Price, $4.00. E. & F. N. Spon, New York.

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Astronomical Telescopes, from 6″ to largest size. Observatory Domes, all sizes. Warner & Swasey, Cleveland, O.

Peerless Leather Belting. Best in the world for swift running and electric machines. Arny & Son, Phila.

"How to Keep Boilers Clean." Send your address for free 88 page book. Jas. C. Hotchkiss, 86 John St., N. Y.

The most complete catalogue of Scientific and Mechanical Books ever published will be sent free on application to Munn & Co., 361 Broadway, N. Y.

Shafting, Couplings, Hangers, Pulleys. Edison Shafting Mfg. Co., 86 Goerck St., N.Y. Send for catalogue and prices.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

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For Steam and Power Pumping Machinery of Single and Duplex Pattern, embracing boiler feed, fire and low pressure pumps, independent condensing outfits, vacuum, hydraulic, artesian, and deep well pumps, air compressers, address Geo. F. Blake Mfg. Co., 44 Washington, St., Boston; 97 Liberty St., N. Y. Send for catalogue.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Knots, Ties, and Splices. By J. T. Burgess. A Handbook for Seafarers and all who use Cordage. 12mo., cloth, illustrated. London, 1884. Sent, postage prepaid, on receipt of 75 cts., by Munn & Co., New York.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 398.

Universal and Independent 2 Jaw Chucks for brass work, etc., both box and round body. A. F. Cushman, Hartford, Conn.

Cyclone Steam Flue Cleaners are the best. Crescent Mfg. Co., Cleveland, O.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., Phila.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 61.

Wanted.—Patented articles or hardware specialties to manufacture on contract or to manufacture and place on the market. First-class facilities. Correspondence solicited. Address Hull Vapor Stove Co., Cleveland, Ohio.

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 62.

"*To Mechanics.*"—When needing Twist Drills, ask for "*Standard,*" or send for catalogue to Standard Tool Co., Cleveland, O. See page xi., Export Edition.

The best Steam Pumps for Boiler Feeding. Valley Machine Works, Easthampton, Mass.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. W. S. sends a small piece of a bitter root for identification. A. There are so many of our native plants that have bitter roots that it would be impossible to identify them by a piece of the root alone—especially by so small a fragment as our correspondent sends. Let us have the leaves and flowers of the plant, or the fruit, if not in flower, and we will name it for you.

(2) A. C. B. asks how to destroy chiccory when it has taken possession of a lawn. A. In the first place, it is very important that the young plant be not allowed to mature breathing organs—leaves. Cut the plant off just beneath the surface as soon as it appears; do not wait till it is large enough to pull up. Sometimes it may appear again in a weakened state after it has been treated as above; but it will probably not make its appearance a third time.

(3) A. F. L. desires a sure and certain death to bedbugs. A. We know of nothing better than the following: Mix together 2 ounces camphor, 4 ounces spirits of turpentine, 1 ounce corrosive sublimate, and one pint of alcohol.

(4) C. McD. asks: Is there an oil extracted from coal tar such as made in gas works? If so, what process do they use? A. Crude petroleum is frequently called coal tar oil. The heating of coal tar itself gives rise to benzol, toluol, and members of the aromatic group. From the two mentioned previously aniline oil is derived, which is the starting point in the manufacture of many of the aniline colors.

(5) F. W. D. asks for a good chasing pitch or composition, for backing up metal, so that it can be chased in high relief and with sharp outlines, to be used on sheet brass about 25 gauge. A. Use a mixture of one part beeswax with two parts rosin, with sufficient sweet oil to soften the composition to fancy.

(6) P. A. F.—The darkening in color is due to the decomposition of the whitelead. There are various theories as to its cause, none of which are satisfactory; but the fact is well known that houses painted with whitelead near the sea shore very rapidly darken in color. The only remedy that we can suggest is the substitution of zinc white for lead white. The use of dark colors is also recommended.

(7) E. L. desires a receipt for a brilliant black varnish for cooking and gasoline stoves. A. Try the following:

Asphaltum	2 lbs.
Boiled linseed oil	1 pint.
Oil of turpentine	2 quarts.

Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot, stir well, and remove from the fire. When partially cooled, add the oil of turpentine. Some makers add driers.

(8) F. N. E. writes: Do you know of any preparation that could be economically used to harden the surface of a seasoned pine floor; the floor to be used for roller skating? A. Wood that is steeped in or covered by a paint brush with a solution of copperas, marking 2 to 2½° Baume, becomes both harder and more indestructible. We believe, however, that ash or maple are the varieties of wood generally preferred for skating rinks.

(9) C. T. B. wants formula for developer for developing plates which have had instantaneous exposures. A. See Beach's Potash Developer, in August 2 number of SCIENTIFIC AMERICAN. No toning is necessary for dry plates. It is used in toning silver prints.

(10) A. L. writes: Can you give me instructions to kiln dry sweet potatoes? A. They can be dried in an oven at moderate heat, but the best plan is to use an ordinary fruit evaporator; much better results can then be obtained.

(11) W. T. K. asks: What are the chemicals, the quantity of same, and process required, for solar printing, so that, for finished prints, which are taken from tracings, the paper shall be white, and the lines a dark blue or black? A. The paper is first prepared by dipping it in a bath composed of:

Distilled water	10 ounces.
Iron perchloride	1 "
Oxalic acid	4 drachms.

When dry the paper, if protected from light, can be kept as long as may be necessary. To copy a drawing, the model on oiled or transparent paper is applied on some paper thus prepared, and the whole exposed to light in an ordinary photographic printing press. The paper, on being withdrawn from the press, is placed in a bath containing from 15 to 18 per cent of ferrocyanide of potassium. It is then washed in an abundance of water, passed in a bath containing 8 to 10 per cent of muriatic acid, washed again, and dried. The explanation of the operation is as follows: The perchloride of iron, under the influence of light, is reduced by the oxalic acid to the protochloride, which is soluble in a solution of ferrocyanide of potassium, while the same potassium salt transforms the perchloride into the in-

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soluble cyanide, well known under the name of Prussian blue. As the black lines of the engraving to be reproduced protect the paper from the action of the sun the perchloride remains unchanged in such places, and the drawing appears in the copy in sharp lines of a dark blue color on a white ground. You will find the process more elaborately detailed in Spons' Workshop Receipts, Second Series, which we can send you for $2.

(12) J. E. J. asks: Can a person's eye be taken out and replaced without destroying the sight? Will not the optic nerve be destroyed? A. Under certain circumstances the eye may be bulged out of position by tumors or cancers, and by dexterous manipulation, such excrescences have been removed, although hey were beyond the eye. The eye cannot be removed, and the optic nerve is so exceedingly sensitive that it is only handled under the most important circumstances.

(13) J. S. W. asks (1) how to treat cases of sunstroke. A. The treatment of sunstroke is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 29. 2. How to treat cases of poisoning by such plants as the poison ivy, poison sumac, or poke? A Bathe the poisoned parts thoroughly with hot water, without soap. When dry, paint the place 2 to 4 times a day liberally with a feather dipped in strong tincture of lobelia. Avoid bringing the tincture in contact with any fresh wound or excoriation. An application in a similar manner of the fluid extract of Gelsemium sempervirens is said to be equally efficient.

(14) G. E.—Please inform me through your paper, are there any mathematical journals published in this country, where can I get them, what are the rates of subscription? A. There are many scientific and mechanical papers, with much mathematics, but we know of no exclusively mathematical papers.

(15) R. H. K.—Superfluous hair can probably be removed by electricity, though its practical success is not yet generally conceded. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 176 or 353, on this subject. We know of no way that is unobjectionable.—Paraffine is melted and forms a waterproof and air coating over the top of the fruit jar, but is not incorporated with the fruit.—Rub leather which has become dry and hard with castor oil, cod oil, or neat's foot oil, or better still, with a mixture of tallow and oil warmed.

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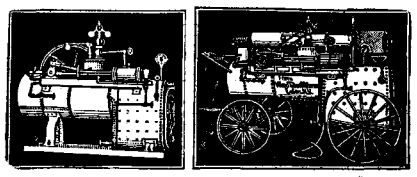

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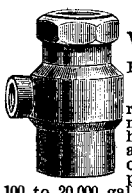

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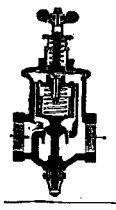

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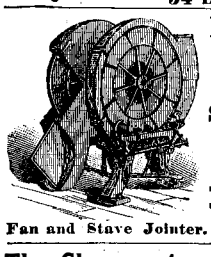

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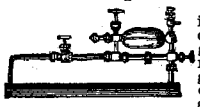

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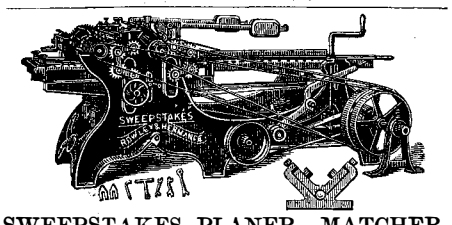

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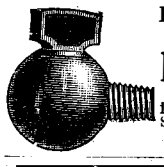

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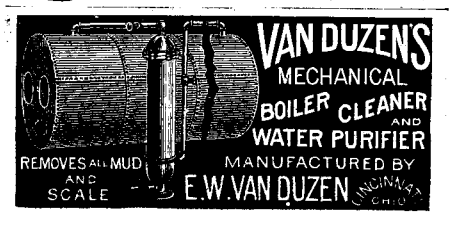

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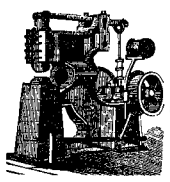

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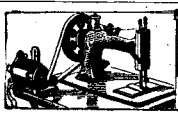

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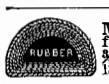

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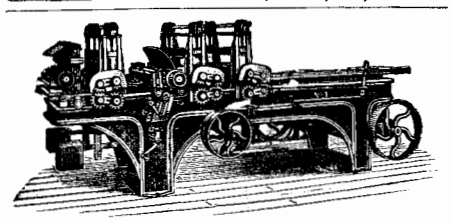

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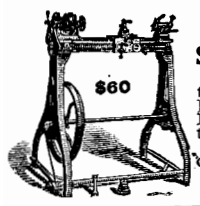

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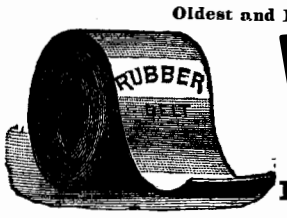

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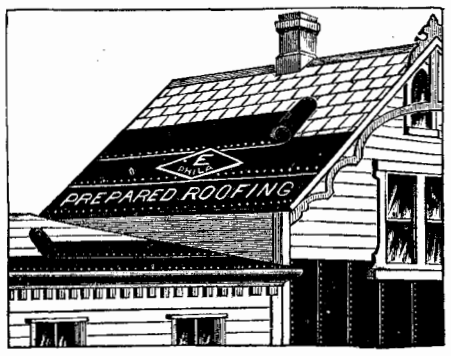

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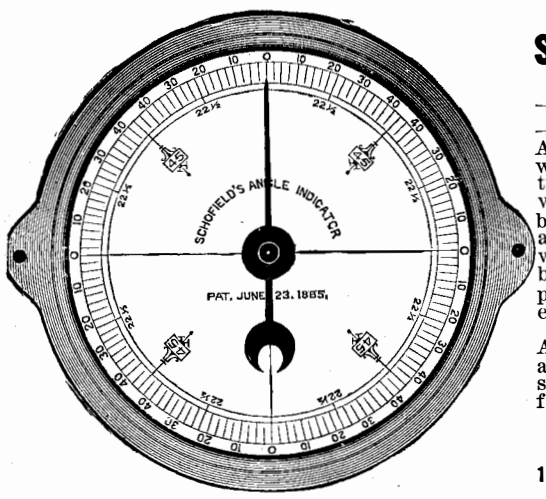

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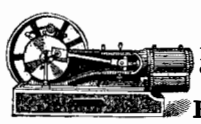

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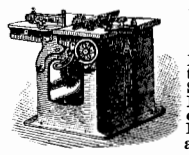

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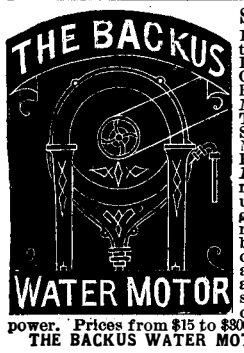

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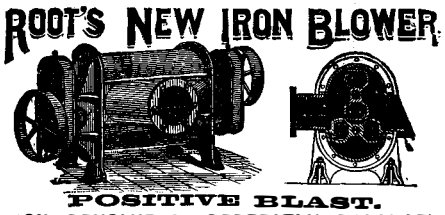

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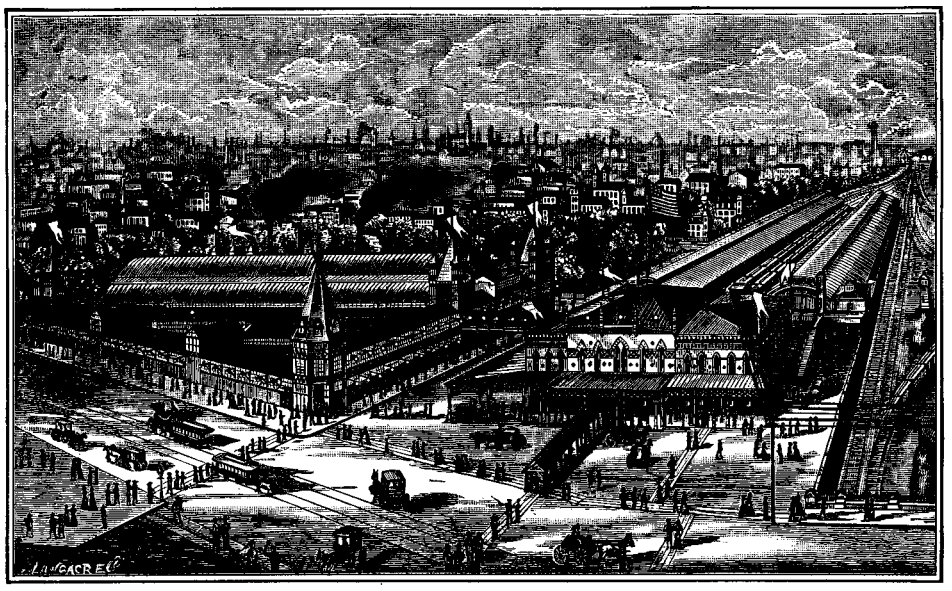

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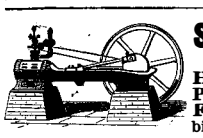

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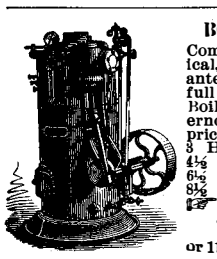

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